

PUBLIC HEALTH REPORTS

Volume 72

and

PUBLIC HEALTH MONOGRAPHS

1957
index



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEROY E. BURNEY, *Surgeon General*

THIS INDEX to *Public Health Reports* and Public Health Monographs is divided into a subject index and an author index.

The subject index carries one or more entries for each item published. In addition to the subject headings, categorical headings include ANNOUNCEMENTS (divided into EXAMINATIONS, ORGANIZATIONS, and PERSONNEL), CONFERENCE REPORTS, DEATHS, FILMS, FRONTISPIECES, GRANTS AND FELLOWSHIPS, LEGAL NOTES, PUBLICATIONS, PUBLIC HEALTH MONOGRAPHS, and TRAINING COURSES.

Public Health Monographs published concurrently with *Public Health Reports* in 1957 are listed in numerical order under that category heading. The monograph summaries appearing in the journal are indexed under appropriate subject headings.

One asterisk before the page number indicates an original, signed article. The sign of two asterisks, used only in the author index, indicates a monograph. Entries without any symbol may refer to summaries or briefs of papers presented at conferences, narrative conference reports, statements or reports of committees, short reports without authors, or similar items.

Illustrative material on the inside of the front cover of each issue is indexed by month under the heading FRONTISPIECES. It is recommended, therefore, that the covers be included in a bound volume.

A compiled annual list of Public Health Service publications may be obtained from the Public Inquiries Branch, Office of Information.

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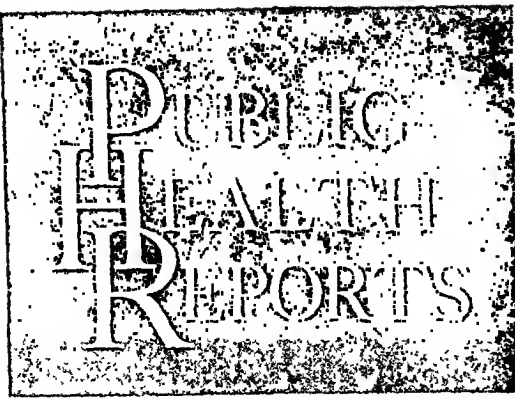
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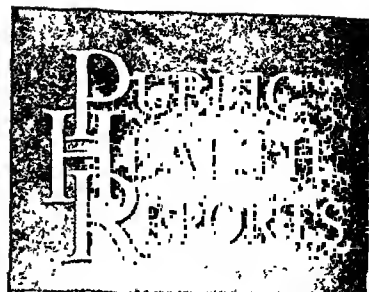
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frontispiece

An ailing Navajo child receives the traditional tribal "cure." Holding the child, the mother squats on a sand painting drawn by a medicine man. (Photos courtesy of the American Museum of Natural History.)

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LEROY E. BURNET, *Surgeon General*

The National Health Survey Act

WITHIN A FEW MONTHS, the Public Health Service will begin a survey of the health of the American people. On July 3, 1956, the President signed into law a bill authorizing a continuing survey of disease, injury, impairment, and disability in the United States. The program, located in the Division of Public Health Methods, will include a series of special studies to collect other detailed morbidity data and additional studies to evaluate the methods used in the survey.

Historical Background

Twenty-one years ago last September, the last effort to obtain comprehensive statistics on illness in the general population was getting under way. The National Health Survey of 1935-36 was a tremendous undertaking in which interviewers visited 737,000 urban households to find out which members of the household had experienced disabling illness and which had specified chronic diseases or impairments.

In the years since the 1935-36 survey its findings have formed the basis for more than 200 reports, articles, and comparative studies. Even in recent years the urban statistics from that survey, generalized to the country as a whole and adjusted for population changes, have provided the only available estimates of the prevalence of many important diseases.

Although the National Health Survey of 1935-36 was by far the largest study ever devoted to learning the facts of illness and injury in the general population, it was not the first of its kind in this country. A number

of smaller studies had demonstrated that the interview method can provide useful information about the amount and distribution of disease, the circumstances of injury, the loss of time from work or other usual activities resulting from disease and injury, and the utilization of medical care in connection with morbidity. Best known of these are the Hagerstown, Md., studies of the early 1920's and the survey made during the years 1928-31 by the Committee on the Costs of Medical Care.

The smaller, community-type studies continued after 1936, and additional refinements were made in the techniques. An important example of an intensive community study is the Eastern Health District Study conducted in Baltimore by the Public Health Service and the Milbank Memorial Fund in the years 1938-43.

At the same time, great advances were made in the science of population sampling, with the Bureau of the Census leading the way in the development of practical methods for applying the theory of probability sampling in the field. In 1943 the Census Bureau, building upon an earlier survey by the Works Progress Administration, began to collect information on the labor force by conducting interviews each month in a national sample of households. Now known as the Current Population Survey, that survey, almost from its start, was used to satisfy some of the growing demand for national morbidity statistics by adding, from time to time, questions on illness to the basic questionnaire. As recently as September 1956 the Current Population Survey carried a supplement dealing with the utilization of hospital care.

Neither the intensive community studies nor the occasional limited data supplied by adding questions to the Current Population Survey

*Prepared by the Division of Public Health Methods,
Office of the Surgeon General, Public Health Service.*

Linder to Direct Program

Forrest E. Linder, Ph.D., has been named director of the National Health Survey Program of the Public Health Service. The new program will use scientific sampling techniques to survey the nature and extent of illness and disability in the population each year.

Formerly deputy chief of the National Office of Vital Statistics of the Public Health Service, Dr. Linder returns to the Service from the United Nations Statistical Office, where he was chief of the demographic and social statistics branch. During World War II he had technical responsibility for the reorganization of the medical statistics of the Navy.

were capable of filling the increasing needs. Public health programs, both public and private, and health insurance plans, medical research efforts, and programs to conserve manpower were increasing in scope. A broader statistical base was needed for the planning and evaluation of these programs.

Furthermore, the national data collected in 1935 and 1936 were becoming increasingly inappropriate as descriptions of the current health of the population as a whole. Two wars, the "wonder" drugs, returning prosperity, and a great increase in the proportion of the population covered by hospitalization insurance brought changes whose effect on morbidity could not be measured. Overweight, smoking history, exposure to air pollution, and other aspects of the environment scarcely touched on in the earlier surveys had become significant factors in epidemiology.

The National Committee

In January 1949 the United States National Committee on Vital and Health Statistics was established. Recognizing the obsolescence of the existing data, the committee gave immediate attention to the problem of obtaining adequate national morbidity statistics. Two successive ad hoc subcommittees were set up by the chairman of the national committee "to frame the problems in morbidity statistics, including

chronic diseases and medical care statistics, in order that morbidity data may be directly related to demographic factors." These subcommittees recommended study of a number of methodological questions, but, even as the recommendations were being made, steps were being taken in several parts of the country to get some of the answers in community surveys. About the same time a bill calling for an 18-month study of methods of measuring illness passed the Senate but failed of passage in the House of Representatives.

Within the next few years, sample surveys of illness were initiated in New York City, in San Jose, Calif., in Hunterdon County, N. J., and in Pittsburgh. Every one of these, as well as later surveys in Baltimore, Kansas City, and in the State of California contributed to the knowledge of how such data collection can be made more accurate and useful.

Anticipating the solution of the methodological problems raised in the ad hoc subcommittees, the chairman of the national committee, in February 1951, established the Subcommittee on National Morbidity Survey and charged it with the drafting of "a plan for a national morbidity survey keeping in view the interests of local areas." It was the report of this group that led to the proposal for specific legislative authorization for a continuing national program. This report (1), which is the basis for the present National Health Survey, contains a valuable list of the major applications of morbidity statistics. These are given on page 3.

Provisions of the Act

The Department of Health, Education, and Welfare proposed in the summer of 1955 legislation specifically authorizing the Surgeon General of the Public Health Service to conduct a continuing survey of illness and disability in the Nation. A bill was drafted, made part of the President's legislative program on health matters, and introduced in both houses of Congress in February 1956. The few amendments added tended to strengthen the bill (2, 3), which passed the Senate in March and the House of Representatives in June. The Senate concurred in the House changes, and on

Uses for Morbidity Statistics

Administrative planning: Statistics on the incidence and prevalence of illness and accidental injury and the resulting disability are used as a guide to administrative planning and the evaluation of public health programs. Illustrative applications of morbidity and disability statistics include the ranking of public health problems in order of importance and the determination of how resources should be divided among various programs; checking the adequacy of notifiable disease reporting; and analyzing trends of specific diseases to evaluate the effect of preventive and therapeutic innovations.

Manpower problems: Another application of morbidity statistics, particularly those providing measures of disability, is in the field of manpower problems. To estimate the economic loss to industry resulting from morbidity, information on absenteeism owing to disease and injury is required. Data on the numbers of persons with chronic diseases and handicapping conditions, and the employment status of such persons, will permit estimates of potential additions to the labor force. Statistics on the sickness rates of handicapped persons, as compared with the nonhandicapped, would be useful to industry and the armed services.

Industrial use: The pharmaceutical and appliance industries have an interest in statistics in order to estimate the markets for particular preparations and appliances. Such information should include data on the utilization of medical services of various types, for example, the frequency of particular operations and of prescriptions and the use of hearing aids and artificial limbs.

Health education: Accident prevention agencies require estimates of the national incidence of accidental injuries, by type and degree of disability. Estimates of the prevalence of cerebral palsy, multiple sclerosis, blindness, deafness, and many other diseases and impairments are needed by voluntary health agencies concerned with these conditions.

Provision of health services: Morbidity data are often used as the basis for estimates of the needs for hospital facilities, nursing home beds, home care programs, or other types of facilities or services. Such information may be used to estimate the number of persons requiring rehabilitation services, to help in planning the extension of the scope of medical care insurance, and for similar estimates in the field of medical care.

Medical research: While morbidity statistics from surveys of the general population are not suitable for making conclusive tests of hypotheses in medical research, they can be useful in suggesting hypotheses for further testing. For example, information on the association between the incidence or prevalence of various diseases and demographic factors, such as age, sex, marital status, occupation, and economic status, may point the way for more intensive investigations. Likewise, data on the geographic distribution of diseases will sometimes provide clues to their causes.

—Excerpts from *“Proposal for Collection of Data on Illness and Impairments: United States,”* report of Subcommittee on National Morbidity Survey, United States National Committee on Vital and Health Statistics.

July 3 the President signed the bill. In late July, Congress appropriated funds for the first fiscal year of operation.

The major provisions of the National Health Survey Act follow.

“(a) The Surgeon General is authorized . . . to make, by sampling or other appropriate means, surveys and special studies of the population of the United States to determine the extent of illness and disability and related information . . . and . . . in connection therewith, to develop and test new or improved meth-

ods for obtaining current data on illness and disability and related information.

“(b) The Surgeon General is authorized, at appropriate intervals, to make available, through publications and otherwise . . . the results of surveys or studies made pursuant to subsection (a).

“(c) For each fiscal year . . . there are authorized to be appropriated such sums as the Congress may determine for carrying out the provisions of this section.

“(d) To assist in carrying out the provisions

of this section the Surgeon General is authorized and directed to cooperate and consult with the Departments of Commerce and Labor and any other interested Federal departments or agencies and with State health departments. For such purpose he shall utilize insofar as possible the services or facilities of any agency of the Federal Government and . . . of any appropriate State or other public agency, and may . . . utilize the services or facilities of any private agency, organization, group, or individual, in accordance with written agreements . . ."

Public Law 652 is in the form of an amendment, as section 305, to the Public Health Service Act of 1944 (Public Law 410, 78th Cong.). It also amends another section of the basic act by authorizing the Surgeon General to "make available, to health officials, scientists, and appropriate public and other nonprofit institutions and organizations, technical advice and assistance on the application of statistical meth-

ods to experiments, studies, and surveys in health and medical fields." In addition it is important to note that Public Law 652 provides that information collected under the authority of the act is to be obtained "on a non-compulsory basis."

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- (2) U. S. Congress, Senate: Continuing survey and special studies of sickness and disability in the United States. Report No. 1718 to accompany S. 3076. 84th Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1956.
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Knutson 1957 APHA President

Dr. John W. Knutson. Assistant Surgeon General and chief dental officer of the Public Health Service since 1952, is president of the American Public Health Association for 1957. He succeeds Dr. Ira V. Hiscock of Yale University.



Dr. Knutson first joined the Public Health Service in 1931. He was assigned to the States Relations Division in 1944 as chief of the Dental Section and later served as chief of the Division of Dental Public Health.

He was chairman of an international group of consultants convened in Geneva in 1954 by the World Health Organization prior to the

establishment of a permanent program of dental health. Long active in the Federation Dentaire Internationale, he is vice president of its Commission on Public Dental Health Services and chairman of the Subcommittee on Statistics. In 1955 Dr. Knutson joined the WHO staff for 6 months to organize its dental program.

He is a diplomate and founding member of the American Board of Dental Public Health, and since 1948 has been instructor in dental public health in the School of Dentistry, Georgetown University. Dr. Knutson is an editor of the Year Book of Dentistry and a contributing editor of Dentistry in Public Health by Pelton and Wisan. He is also the author of a number of reports on dentistry.

Organization of National Health Survey

THE THREE TYPES of activity authorized in the National Health Survey Act have as their purpose the obtaining of "accurate and current statistical information on the amount, distribution, and effects of illness and disability in the United States and the services received for or because of such conditions" (1). These three activities—a sample survey of the population, a series of special studies, and the development and testing of new or improved methods for obtaining current data—constitute the National Health Survey Program. To plan and direct the program, a small, experienced staff is being recruited in the Division of Public Health Methods of the Public Health Service.

The nucleus of the staff is already at work, drafting plans to implement the act. Successful execution of the program will require the assistance of health departments, the medical and dental professions, hospitals, and many other sources of health information. It is the understanding and cooperation of the general public, however, that is the most important ingredient of success.

The Bureau of the Census is providing expert help in designing the sample survey of the population. Technical consultants will give advice on all methodological aspects of the program. Three advisory committees will review the plans, keep the staff informed of needs for statistics which the program is capable of filling, and advise on obtaining the cooperation of professional groups and the public. One advisory committee will be drawn from operating agencies within the Department of Health, Education, and Welfare. A second committee will comprise representatives of all Federal departments and agencies having an interest in the data to be supplied.

*Prepared by the Division of Public Health Methods,
Office of the Surgeon General, Public Health Service.*

The third committee will be made up of leaders from the professions and business and from State and local governmental fields.

In addition to these consultants and committees, the program staff will have frequent discussions with individual agencies and groups about ways in which the program can be made more useful.

Planning for the three phases of the National Health Survey Program is now going on. First priority is being given to setting up the sample survey of the population. Methodological studies are, of course, an essential part of the planning process and will continue throughout the program since improving the techniques and adding to the usefulness of the results should never be considered to be complete. Collection of data for the series of special studies will not begin until after the sample survey is under way.

Despite the fact that decisions on various points are not yet final, it is possible to describe now, in general terms, the plans for the program.

The Household Survey

The sample survey phase of the program will consist of a continuous sampling of households on a national basis. Information will be collected in each household by carefully trained and supervised interviewers. The Bureau of the Census is devising sampling and field interviewing plans and preparing instruction and training manuals. The bureau will hire and train interviewers, supervise the field work, edit and code the questionnaires, and produce the required tabulations. The Public Health Service is responsible for the content of the survey questionnaire, for content of the tabulations that will be made of the replies, and for the analysis and publication of the results.

Field work on the household survey will start

with pretesting activities on a small scale in early 1957. A "dry run" on a national scale will follow later in the spring. Collection of statistical information for periodic publication will begin about July 1.

The Questionnaire

When the household survey is in full operation, the questionnaire for the interview will consist of two parts, core items and supplements. Core items will include only the most basic types of information and will remain on the questionnaire for a long period of time. During the dry run period of the survey, only core items will be on the questionnaire.

The core questionnaire, as presently planned, will provide information on the incidence of illnesses and injuries involving either medical care or loss of time from usual activities (for example, the number of days lost from work or school), or both. The prevalence of chronic conditions known to the family and of various types of impairments will be obtained to the extent that they have caused trouble for the individual within a year preceding the interview. Persons with chronic conditions will be classified according to the degree to which these conditions have limited their activities.

In addition, core questions will ascertain the number of visits to physicians and dentists and the number and duration of hospital stays as well as the number of operations performed while the family member has been in the hospital.

These various measures of illness, disability, and medical care will be classifiable, on the basis of information collected in the core questionnaire, by age, sex, race, marital status, educational attainment, income, occupation, and industry for those in the labor force, by usual activity for those not in the labor force, and by residence in farm and nonfarm areas. The illness will also be classifiable by diagnosis in broad groups and by physician attendance.

After the dry run, the questionnaire will be opened for special supplementary inquiries. In this way, flexibility in content can serve the interests of additional users of the data. The supplements may be repeated at regular intervals or may be included once only. Since the total amount of interviewing in any one month

will be relatively small, supplements may remain on the questionnaires for 3 months or longer depending on the degree of geographic detail required.

Collection of Data

Initially, the sample of households will be selected within the 330 areas (counties, parts of counties, or metropolitan areas) that constitute the first stage of sampling for the Current Population Survey of the Census Bureau. The Current Population Survey has for some years been collecting information, from a national sample each month, on employment, unemployment, and other economic data. Except very rarely, and then by chance, the households interviewed for the National Health Survey will not be the households sampled in the Current Population Survey.

After the dry run, which has as its major purpose the establishment of smoothly operating procedures, the household survey will be expanded gradually over a 6-month period until it includes approximately 400-450 sample areas known as primary sampling units. The reason for this difference in the design of the two national samples is that the National Health Survey will require estimates in greater geographic detail than the Current Population Survey.

The number of interviews in the primary sampling units will be far fewer than in the Current Population Survey. The interview rate during the dry run will be approximately 3,000 households a month for the country as a whole. By the end of 1957 it is hoped to increase the rate to about 3,500 households a month. This is in contrast to the 35,000 households interviewed each month in the Current Population Survey.

A careful control on the quality of the interviewing will be maintained by a regular program of reinterviews, and other devices, in a subsample of the households.

Publication of Data

The present plan is periodically to publish separate morbidity statistics for each of nine standard metropolitan areas: New York, Chicago, Los Angeles, Philadelphia, Detroit, San Francisco, Boston, Pittsburgh, and the com-

bined Washington, D. C.-Baltimore area. In addition, separate statistics will be published periodically for each of 11 geographic regions of the country. These correspond to the 9 standard geographic "divisions" of the Census Bureau, except that the East North Central Division and the South Atlantic Division each will be divided into two parts. Data from the regions will be shown separately for large metropolitan areas as a group, all other urban areas as a group, and rural areas.

To publish statistics in this maximum geographic detail, it will be necessary to accumulate data for a period of 2 years. However, summary statistics may be presented at more frequent intervals for four major Census Bureau regions of the country (Northeast, North Central, South, and West) as well as by size of place, in terms of population, for the country as a whole.

According to present plans, the most frequent publication of any particular statistical table will be at intervals of 3 months. Data for the preceding calendar quarter will be included. These published tables will be devoted to information for which it is desirable to show quarter-to-quarter change. An example might be the frequency of injuries resulting from automobile accidents.

Special Studies

The special studies will produce auxiliary information of a type that the household interview cannot provide. They will be based either on subsamples of the national household sample or on separate samples. Though they may vary in nature, all special studies will be based upon scientifically designed samples so that the results can be generalized to a defined population. They will emphasize the measurement of disease by means of clinical tests, physical examinations, or the analysis of medical records. The entire health survey program is planned as an integrated system in which the special studies will supplement the data obtained in household interviews.

Because of wide interest in the prevalence of chronic diseases and impairments, including conditions not yet diagnosed, the first of the special studies will be designed to provide a

thorough medical and dental evaluation by a professional team for a cross-sectional sample of persons of all ages. The need for statistics on undiagnosed and nonmanifest conditions has been emphasized by the Subcommittee on National Morbidity Survey (2). Two recent surveys, one in Hunterdon County, N. J., and one in Baltimore, have demonstrated that, in conjunction with a household interview survey, the medical evaluation of a subsample can produce useful data.

The staff of the National Health Survey Program will conduct the studies with the help of field personnel employed for each study. Part of the work, however, such as the abstracting of medical records, may be contracted to organizations with access to the information needed.

Although first priority is being given to the household survey, staff and consultants of the program have begun to design the first of the special studies for the National Health Survey. Field work on this study, however, probably will not begin before late 1957.

Methodological Studies

The third phase of the program will include methodological experiments in connection with the national household survey; studies to determine the nature and magnitude of errors of measurement associated with clinical tests and physical examinations; matching of data from one source against data from another; and basic investigation of entirely different methods of measurement, such as panels of physicians keeping records concerning the patients under their care.

The methodological studies will be conducted sometimes alone by the staff of the National Health Survey Program, and at other times in conjunction with the Bureau of the Census or other organizations. Some methodological problems may be investigated by schools of public health, health departments, health insurance agencies, or research groups employed on a contract basis.

Limitations of the Program

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The present plan is periodically to publish separate morbidity statistics for each of nine standard metropolitan areas: New York, Chicago, Los Angeles, Philadelphia, Detroit, San Francisco, Boston, Pittsburgh, and the com-

Supply, Distribution, and Use of Poliomyelitis Vaccine

By JACK C. HALDEMAN, M.D.

WITH THE ANNOUNCEMENT of the successful results of the 1951 field trials of Salk poliomyelitis vaccine, the way was opened to prevention and control of one more communicable disease.

The extraordinary progress achieved in this past year and a half in providing at least partial immunization to the most susceptible population is a tribute to the working partnership of the medical and pharmaceutical professions, local, State, and Federal governmental agencies, voluntary agencies, the drug manufacturers, and individual citizens. Together, they have labored diligently to insure the most equitable possible distribution and use of the limited amount of vaccine available.

The purpose of this article is to review the results of this cooperative effort and to outline the course that lies ahead for provision of maximum protection against poliomyelitis for the total population.

Supply and Distribution

We are no longer faced with the problem of short supply of vaccine. The voluntary system of Federal allocation of vaccine, which was

adopted as the most equitable method for distribution of a scarce product, was terminated on August 1, 1956. Decontrol of vaccine was made possible by the following sequence of events.

Vaccine production had built up slowly through 1955 and the early months of 1956, but releases during April, May, and June brought the supply up to the demand level in a number of States. By July 27, 1956, more than 85 million cubic centimeters of vaccine had been released. Since there are approximately 65 million persons in the group most susceptible to poliomyelitis in this country (persons 0 through 19 years of age and expectant mothers), enough vaccine was now available to provide two injections for 70 percent of those eligible to receive it.

Because of State variations in immunization programs and the more plentiful supply of vaccine, a number of States did not request their shares of vaccine released during late June and July 1956. This necessitated reallocation of their shares to those areas of the country where demand still exceeded available supply. For these reasons, it was decided that the needs of all areas could best be met by releasing vaccine through normal distribution channels rather than through the Federal system of allocation to the States.

Since Federal decontrol of vaccine, an additional supply of more than 28¾ million cubic centimeters has been released. All parts of the country now appear to be able to get as much vaccine as they need.

Termination of the allocation system does not affect the allotment of Federal funds avail-

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tistics. We have available today only piecemeal data—from special studies and surveys, from reports on particular kinds of diseases, or from records kept for a variety of purposes on particular segments of the population" (3).

"A national health survey based on a representative sample of the total population would provide a comprehensive picture of illness, both with respect to coverage of the population and to inclusion of the entire range of types of illness. As such it will supplement and extend existing sources of health data" (4).

These statements appeared in the Senate and House of Representatives reports on the proposed national health survey. However, recognition of the potential value of the survey in defining more clearly the extent of illness and disability in the Nation should not obscure the fact that the program has definite limitations.

The size of the national sample, for example, is such that estimates in greater geographic detail than planned cannot be made without enlarging the sample for that purpose. Moreover, the sample cannot provide independent information concerning persons in small groups of the population or for diseases of low frequency.

Further, there are limitations to the accuracy of diagnostic information collected in household interviews. The household respondent, at best, can pass on to the interviewer only the information the physician has given to the family. For conditions not medically attended, diagnostic information is often no more than a description of symptoms. Facts concerning the circumstances of the illness or injury and the resulting action taken by the individual, such as going to bed or seeing a physician, can be obtained more accurately from household members than from any other source. However, when clinical detail or diagnoses for unattended or nonmanifest illness are required, information procured by interview does not substitute for a medical examination. For this reason, information collected in the special studies, for example, by physical examinations and clinical tests, will supplement the results from the household survey.

The statistics from the program will not provide critical tests of clinical and epidemiological hypotheses. For example, the program could not test the hypothesis that a specific vaccine would prevent a certain disease. For this, an experimental design, a control group, and similar conditions would be required. The program may, however, suggest hypotheses that can be tested by other appropriate means. Information that is required quickly for corrective action, as in an epidemic, will have to come from other sources, such as the notifiable disease reporting system.

The program is intended to supplement existing sources of information and provide a background of broadly based illness statistics. It does not purport to replace the many ad hoc studies now being conducted.

Aside from such limitations as these, imposed by the methods to be used and the resources available, the program is free to collect any statistics on the incidence, prevalence, or other measures of disease, injury, or impairment, the disability or other effects of this morbidity, and the medical care used in its treatment. The sole guide is the usefulness of the data.

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Prompt Use of Poliomyelitis Vaccine

Secretary Folsom's report on the Salk poliomyelitis vaccine deserves the attention of every young adult, of every parent, in America.

The supply of vaccine is now plentiful.

I join with Secretary Folsom, the Surgeon General of the Public Health Service, and the National Foundation for Infantile Paralysis in urging that the vaccine be used promptly before the next poliomyelitis season arrives.

DWIGHT D. EISENHOWER
President of the United States
November 28, 1956

Opportunity Ahead

Knowing of your interest in the poliomyelitis vaccination program I am making this report on developments to date and on a great opportunity which lies ahead.

Millions of children who have so far received only 1 or 2 injections should, before next summer, be given the additional protection provided by the recommended 3 doses. The full benefit of the vaccine is achieved only with 3 injections.

Millions of young adults, as well as children who have had no vaccine at all so far, should now begin their vaccinations in order to receive the full three doses before next summer's peak of poliomyelitis incidence. All States have now made commercial supplies of the vaccine available to adults.

Prompt use of the vaccine—this is our problem and opportunity now. And this will require the earnest and vigorous cooperation of parents, physicians, schools, officials at all levels of government, and public and private health agencies.

Through prompt use of increasing supplies of vaccine, the Nation can go a long way, next year, toward elimination of this dread disease.

The National Foundation for Infantile Paralysis has recognized the need for prompt action and is presently engaged in a vigorous campaign to urge that all unite in this cause—the cause of preventing needless illness.

Since the vaccine was approved for public use—some 18 months ago—about 115 million cc's. or doses, have been released by the Public Health Service. More than \$53 million in Federal funds have been made available to help pay for vaccine for children and expectant mothers.

The results have been extremely encouraging.

Surveys show that among children vaccinated with only one or two doses, the incidence of paralytic poliomyelitis has been reduced about 75 percent. We can expect an even greater reduction as more and more persons receive three injections.

I know you share my gratification at the great progress that has been made, and my hope that the people of the Nation will take full advantage of this opportunity to protect their children and themselves against the ravages of poliomyelitis.

—From a report to the President,
by MARION B. FOLSOM, *Secretary*
of Health, Education, and Welfare.

able to the States for the purchase of poliomyelitis vaccine and the administration of public vaccination programs for children under 20 and expectant mothers. These funds, made possible by the Poliomyelitis Vaccination Assistance Act and amounting to \$53,600,000, will be available until June 1957. As of November 15, 1956, \$34,649,454 had been paid to the States and Territories.

Safety and Effectiveness

The early confidence we had with respect to safety and effectiveness of the vaccine has been reinforced by experience in its use to date.

Since May 1955, when vaccine was first released under revised safety standards, there has been no epidemiological evidence that any case of poliomyelitis has been causally related to the use of poliomyelitis vaccine. This reassuring conclusion is drawn from the study of data in which each reported case of poliomyelitis is related to the lot number of vaccine used, date and site of injection, site of first paralysis, and dates of onset of the disease and of paralysis.

Epidemiological studies conducted by 22 States and New York City during the 1955 poliomyelitis season showed that the paralytic attack rate among the unvaccinated children was consistently higher than among the vaccinated. Further studies in 1955 revealed that only among 7- and 8-year-old children, those for whom the vaccine had been used almost exclusively that year, was there a sharp lowering of paralytic attack rates. Thus, the 1955 experience reaffirmed the confidence in poliomyelitis vaccine established by the 1954 field trials.

Because of a continuing higher rate of vaccination throughout the current poliomyelitis season, completely comparable studies, yielding quantitative estimates of vaccine effectiveness, will not be possible. Therefore, characteristics of the current incidence are being studied to determine any changes attributable to the vaccine. Preliminary reports from a number of States in 1956 revealed that vaccinated cases comprise a low proportion of the total paralytic cases. Furthermore, in every age group the proportion of cases that are paralytic is greater among nonvaccinated cases than among the vaccinated.

The weekly incidence of poliomyelitis for the current year (1956) has been running at a lower level than in any year since 1947. The number of cases reported so far this year is about half the past 5-year average. Except for the severe outbreak in Chicago, only Louisiana and Utah have reported high incidence. California reported moderate incidence. Occurrence in most of the remaining States has been exceedingly low. From the national incidence figures alone, it is not possible to attribute this entire decrease to the vaccine. However, the studies mentioned strongly support the conclusion that the reduction is at least partially due to the vaccine. If we can achieve a high level of vaccination coverage, we should be able to conquer poliomyelitis.

Although poliomyelitis vaccine is now being used throughout the country, there has been considerable discussion about the use of vaccine during the season of high incidence, particularly in areas where epidemic conditions prevail. This discussion centers around the balance between the benefits of vaccination and the quantitative importance of the provoking effect of vaccinations under such conditions. The ability of immunizing injections of diphtheria, pertussis, and tetanus antigens, and of therapeutic injections such as penicillin, to provoke paralytic poliomyelitis has been reported by several authors. Consequently, before it was tried, there was some concern that poliomyelitis vaccine used during an outbreak of disease might show a similar ability to provoke paralysis.

Poliomyelitis vaccine was first used in an epidemic situation at a naval base in Hawaii in the fall of 1955. Although analysis of this program did not firmly establish the effectiveness of the vaccine in controlling an epidemic, incidence was lower in the vaccinated population. Moreover, a thorough evaluation failed to demonstrate any evidence of a provoking effect of the vaccine. During the first month after initiation of the mass vaccination program, incidence rates were identical in the vaccinated and unvaccinated populations. In the highly exposed family contacts of demonstrated cases, incidence was again similar in the vaccinated and unvaccinated contacts. However, examination of the clinical character of the vaccinated

if they are not being reached by other arrangements.

Unquestionably, high school programs will be needed to "step up" vaccination of teen agers. With schools now in session, there will undoubtedly be more active vaccination programs for adolescents.

Pediatricians have an excellent opportunity to urge young parents to seek immunization for themselves as well as for their children. The incidence of poliomyelitis among young parents is also high, and the degree of paralysis severe, often with tragic socioeconomic consequences. As with the adolescent group, very little preventive medicine is being practiced among these young adults since they have not yet reached the age where they are likely to be reporting regularly to a physician for physical checkups or for treatment of a chronic illness or disability.

Laboratory Diagnosis of Poliomyelitis

Relatively recent findings, which indicate that many diseases masquerade as poliomyelitis, have made physicians increasingly aware of the difficulty of diagnosing true poliomyelitis. It is now generally recognized that nonparalytic cases cannot be accurately diagnosed without laboratory tests. There is growing evidence that laboratory tests are equally important in diagnosing some paralytic cases.

The development of the poliomyelitis vaccine intensifies the need for laboratory confirmation of all cases of poliomyelitis and polio-like diseases. With widespread vaccination, the ratio of polio-like diseases to true poliomyelitis can be expected to increase. Also, the vaccine itself may modify the course of the disease, thus making the diagnosis on purely clinical grounds correspondingly more difficult. Furthermore,

if an accurate evaluation is to be made of the total and long-range effect of the vaccine, it is essential to identify, by laboratory testing, the type of poliomyelitis virus involved for all reported cases.

To provide such testing, a network of laboratories, especially equipped to analyze specimens taken from patients with poliomyelitis or polio-like diseases, has been organized by the Communicable Disease Center of the Public Health Service. The network includes a number of academic research laboratories and State health department laboratories.

Physicians are urged to use these facilities by sending specimens to their State health department or to whatever laboratory the department designates. Full cooperation by all physicians will not only aid in obtaining more accurate diagnoses but will also promote research and make possible a continuing evaluation of the effectiveness of the poliomyelitis vaccine.

Conclusion

In conclusion, the job immediately ahead is to continue immunizing as high a proportion of the susceptible population as possible. This will require the unrelenting effort of both physicians in private practice and members of the public health profession. Once a high level of protection has been attained, holding it over the years becomes our mutual objective. Unless this is done, sporadic outbreaks will continue to recur, as has been clearly demonstrated in the history of diphtheria control.

No group has a more important role in achieving full protection against poliomyelitis than the pediatricians of this country. More mothers are taking their children to pediatricians than ever before. Taking full advantage of this opportunity is a real challenge.

cases showed no predominance of paralytic disease, no concentration of cases 4 to 14 days after vaccination, nor any cases with first paralysis in the inoculated limb. In brief, the characteristics of provoked poliomyelitis were not present. Further, considering the extent of final paralysis in the paralytic cases which occurred within a month following vaccination, it was demonstrated that prior inoculation in an extremity did not increase the frequency of paralytic involvement of the extremity.

Thus, this report is reassuring because no measurable provoking effect could be found. But the study was based on only small numbers of cases.

The Chicago experience will provide an opportunity for further study of the use of vaccine during a serious outbreak—and on a larger population base. More than 1,000 cases of poliomyelitis occurred in Chicago in 1956, comprising more than 10 percent of the national incidence. Soon after the outbreak, a mass vaccination program was undertaken; more than a million doses of vaccine were given. The local health authorities, in cooperation with the Public Health Service, are intensively studying this outbreak. Particular emphasis is being given to evaluation of any evidence of a provoking effect. Although final conclusions cannot be drawn at this time, preliminary analyses have failed to reveal any such evidence so far.

Use of Vaccine

The amount of vaccine shipped into a State is a gross index of use since shipments are made only on bona fide orders which, for the most part, are promptly used.

In one State (Massachusetts) enough vaccine has been shipped to meet more than 65 percent of the total need for 3 injections for persons 0 through 19 years of age and expectant mothers; and in three more States (Illinois, Connecticut, and Utah) more than 50 percent. At the opposite end of the scale, less than 30 percent of the full amount needed has been shipped to 1 State and 1 Territory. Twenty-eight States and 3 Territories could meet between 40 and 50 percent of the need with the

vaccine already received, and 17 States and 2 Territories could meet between 30 and 40 percent. Of course, since many children and expectant mothers are not yet due for their third injections, these percentages are not indicative of the proportion of the priority group who have received some immunization. The figures do, however, indicate the dimensions of the job that remains to be done before the next poliomyelitis season.

Here, then, is the present challenge to the health profession, particularly to pediatricians, general practitioners, and public health physicians. This is still a new program as events in medical history are counted. Continuing educational efforts are required to impress parents with the importance of having their children immunized.

Several States are using some rather unique and interesting methods for stimulating an increase in the demand for vaccine. For example, the Mississippi State Board of Health employed 54 school teachers as "home visitors" for the summer to determine to what extent children in the families visited had been vaccinated and to inform the parents about the vaccination program and, particularly, where vaccinations could be obtained. This technique resulted in an immediate increase in immunizations both by physicians in private practice and by local health departments.

It is of interest to note that even though local health officials had extensively used radio, television, and newspaper publicity to announce the availability of the vaccine, the home visitors found that failure to take advantage of the program stemmed largely from ignorance of the availability of the vaccine or of the eligible age group.

Studies such as this help to pinpoint "soft spots" in educational campaigns, not only with respect to younger children under the supervision of pediatricians but also with respect to older children. The adolescent group is especially difficult to reach, falling in a sort of "never-never" land, too old to be seen regularly by the pediatrician and usually too young for regular visits to other medical practitioners. Perhaps the older siblings of the pediatrician's patients could be offered immunization

**Movement and administrative data for public mental hospitals: United States and each State,
fiscal year 1956**

| State | First admissions | Readmissions | Discharges | Deaths in hospital | Resident patients end of year | Average daily resident patient population | Total full-time personnel, end of year | Maintenance expenditures | |
|------------------------|------------------|--------------|------------|--------------------|-------------------------------|---|--|--------------------------|--------------------------|
| | | | | | | | | Total | Per patient ¹ |
| Totals ----- | 126,510 | 59,521 | 134,702 | 48,478 | 552,186 | 556,276 | 152,439 | \$662,146,372 | \$1,190.32 |
| Alabama----- | 1,581 | 713 | 1,581 | 438 | 7,277 | 7,320 | 1,342 | 5,693,330 | 777.78 |
| Arizona----- | 748 | 314 | 962 | 151 | 1,639 | 1,670 | 495 | 2,202,551 | 1,318.89 |
| Arkansas----- | 1,400 | 741 | 1,713 | 364 | 4,958 | 4,957 | 1,368 | 4,703,446 | 948.85 |
| California----- | 12,354 | 5,915 | 15,031 | 2,800 | 37,390 | 37,002 | 10,081 | 51,389,599 | 1,388.83 |
| Colorado----- | 1,638 | 382 | 1,384 | 605 | 5,628 | 5,696 | 1,950 | 7,861,325 | 1,380.15 |
| Connecticut----- | 2,333 | 1,863 | 4,125 | 1,035 | 8,535 | 8,668 | 3,178 | 14,983,055 | 1,728.55 |
| Delaware----- | 654 | 329 | 841 | 216 | 1,706 | 1,733 | 699 | 2,581,394 | 1,489.55 |
| Dist. of Columbia----- | 1,055 | 272 | 884 | 600 | 6,896 | 7,120 | 2,734 | 14,327,083 | 2,012.23 |
| Florida----- | 1,481 | 403 | 1,093 | 556 | 8,069 | 8,035 | 2,163 | 7,438,657 | 925.78 |
| Georgia----- | 2,678 | 705 | 2,399 | 934 | 11,844 | 11,738 | 1,991 | 11,956,268 | 1,018.59 |
| Idaho----- | 652 | 374 | 820 | 149 | 1,188 | 1,227 | 339 | 1,422,849 | 1,159.62 |
| Illinois----- | 8,465 | 6,150 | 10,493 | 3,822 | 37,885 | 38,176 | 8,983 | 41,161,600 | 1,078.21 |
| Indiana----- | 2,609 | 1,171 | 2,570 | 939 | 10,890 | 10,996 | 3,905 | 15,410,584 | 1,401.47 |
| Iowa----- | 1,573 | 1,304 | 2,447 | 688 | 5,039 | 5,169 | 1,857 | 6,873,078 | 1,329.07 |
| Kansas----- | 1,195 | 503 | 1,438 | 279 | 4,394 | 4,427 | 2,170 | 7,430,543 | 1,678.46 |
| Kentucky----- | 1,482 | 1,248 | 2,144 | 734 | 7,272 | 7,490 | 1,610 | 5,661,448 | 755.87 |
| Louisiana----- | 2,204 | 695 | 2,418 | 450 | 8,270 | 8,262 | 1,992 | 6,268,343 | 758.70 |
| Maine----- | 621 | 287 | 589 | 264 | 2,981 | 3,004 | 876 | 3,424,602 | 1,140.01 |
| Maryland----- | 3,124 | 1,165 | 3,228 | 767 | 9,688 | 9,669 | 2,901 | 12,196,749 | 1,261.43 |
| Massachusetts----- | 6,044 | 1,809 | 6,514 | 2,195 | 22,202 | 22,849 | 7,093 | 31,933,633 | 1,397.59 |
| Michigan----- | 3,333 | 1,621 | 2,869 | 1,561 | 21,482 | 21,860 | 6,584 | 34,571,518 | 1,581.50 |
| Minnesota----- | 2,529 | 2,118 | 3,518 | 1,130 | 11,356 | 11,430 | 2,901 | 12,573,653 | 1,100.06 |
| Mississippi----- | 1,749 | 1,069 | 2,456 | 422 | 5,356 | 5,228 | 1,409 | 3,900,771 | 746.13 |
| Missouri----- | 1,327 | 535 | 1,348 | 711 | 11,753 | 11,912 | 3,167 | 12,341,466 | 1,036.05 |
| Montana----- | 682 | 234 | 674 | 214 | 1,860 | 1,905 | 516 | 2,138,411 | 1,122.53 |
| Nebraska----- | 1,102 | 628 | 1,357 | 448 | 4,756 | 4,741 | 2,073 | 6,571,342 | 1,386.07 |
| Nevada----- | 196 | 35 | 211 | 30 | 439 | 446 | 91 | 536,814 | 1,203.62 |
| New Hampshire----- | 681 | 247 | 674 | 313 | 2,600 | 2,667 | 901 | 3,726,568 | 1,397.29 |
| New Jersey----- | 5,519 | 2,240 | 5,364 | 2,548 | 21,991 | 22,013 | 7,474 | 31,210,016 | 1,418.07 |
| New Mexico----- | 433 | 87 | 280 | 103 | 969 | 997 | 427 | 1,582,646 | 1,587.41 |
| New York----- | 16,108 | 5,778 | 11,122 | 8,661 | 96,212 | 96,768 | 25,674 | 121,677,784 | 1,257.42 |
| North Carolina----- | 2,341 | 1,213 | 2,992 | 518 | 9,794 | 9,890 | 2,825 | 10,583,939 | 1,070.17 |
| North Dakota----- | 635 | 271 | 686 | 159 | 1,886 | 1,923 | 518 | 2,025,722 | 1,053.42 |
| Ohio----- | 7,480 | 3,367 | 8,408 | 2,326 | 28,057 | 28,344 | 7,834 | 33,347,711 | 1,176.54 |
| Oklahoma----- | 1,371 | 888 | 1,541 | 577 | 7,835 | 7,897 | 2,080 | 7,110,393 | 900.39 |
| Oregon----- | 1,971 | 1,039 | 2,072 | 540 | 4,980 | 4,956 | 1,409 | 5,341,377 | 1,077.76 |
| Pennsylvania----- | 5,119 | 2,115 | 3,923 | 3,308 | 39,947 | 40,405 | 11,275 | 45,182,617 | 1,118.24 |
| Rhode Island----- | 952 | 539 | 985 | 451 | 3,402 | 3,414 | 844 | 3,304,549 | 967.94 |
| South Carolina----- | 1,781 | 562 | 1,736 | 455 | 6,199 | 6,113 | 1,381 | 5,007,600 | 819.17 |
| South Dakota----- | 508 | 242 | 571 | 169 | 1,613 | 1,604 | 451 | 1,899,501 | 1,184.23 |
| Tennessee----- | 2,103 | 1,200 | 2,805 | 613 | 8,170 | 8,303 | 1,311 | 5,569,175 | 670.74 |
| Texas----- | 4,532 | 1,868 | 5,711 | 1,239 | 15,937 | 16,150 | 3,180 | 12,215,711 | 756.39 |
| Utah----- | 340 | 112 | 229 | 109 | 1,280 | 1,303 | 430 | 1,156,319 | 887.43 |
| Vermont----- | 387 | 170 | 438 | 147 | 1,234 | 1,281 | 337 | 1,516,693 | 1,183.99 |
| Virginia----- | 2,301 | 1,528 | 3,005 | 1,024 | 11,037 | 11,134 | 2,540 | 10,698,331 | 960.87 |
| Washington----- | 1,418 | 910 | 1,751 | 642 | 7,152 | 7,217 | 2,232 | 8,166,238 | 1,131.53 |
| West Virginia----- | 1,877 | 979 | 1,880 | 492 | 5,404 | 5,486 | 1,045 | 3,794,642 | 691.70 |
| Wisconsin----- | 3,675 | 1,485 | 3,225 | 1,507 | 15,084 | 15,029 | 3,643 | 18,668,582 | 1,242.17 |
| Wyoming----- | 169 | 98 | 197 | 75 | 650 | 652 | 160 | 800,146 | 1,227.22 |

¹ Per patient maintenance expenditure was computed by dividing total maintenance expenditure by the average daily resident patient population in each State.

NOTE: These data are provisional and subject to change. Public hospitals include the State and county hospitals for mental disease and the psychopathic hospitals.

Mental Patient Data for Fiscal Year 1956

ON THE BASIS of summary data submitted to the National Institute of Mental Health of the Public Health Service by the various State and county mental hospital systems for fiscal year 1956, all categories show increases over the year 1955 except resident patients at the end of the year. This category shows a decrease on a national level for the second time in the history of the collection of such data. On the first such occasion, in 1913, there was a decrease of 0.3 percent.

| Item | 1955 | 1956 | Percent- age in- crease |
|--|---------------|---------------|-------------------------------|
| First admissions... | 122,391 | 126,510 | 3.4 |
| Readmissions..... | 55,626 | 59,521 | 7.0 |
| Discharges | 119,146 | 131,702 | 13.1 |
| Deaths in hospital.. | 44,400 | 48,478 | 9.2 |
| Resident patients at end of year... | 559,281 | 552,186 | -1.3 |
| Personnel em- ployed full time at end of year... | 145,462 | 152,439 | 4.8 |
| Maintenance expenditures: | | | |
| Total | \$618,229,797 | \$662,146,372 | 7.1 |
| Per patient... | \$1,112.81 | \$1,190.32 | 7.0 |

Figures shown for 1955 will not agree with those in the comparable report for 1955 (*Public Health Reports*, March 1956, pp. 214-215) since they are based chiefly on data submitted for the 1955 annual census of mental patients and, with the exception of two States, do not represent estimates.

Public mental hospitals were asked, on recommendation of mental hospital statisticians in their fifth annual conference, May 1955, to provide certain basic figures after the close of each year: first admissions, read-

missions, total discharges from the hospitals, and deaths in the hospitals during the year; average daily resident population; resident patients and total personnel employed full time at the end of the year; and total maintenance expenditures for patients (*Public Health Reports*, September 1955, pp. 905-909).

The National Institute of Mental Health made this survey in August 1956. It was realized that final and complete data might not be available because of variation in reporting procedures and fiscal year ending dates. Therefore, the hospitals were requested, if the answers to any or all of the items were unknown at the time of the survey, to enter their best estimates.

Reporting is complete for all hospitals queried. However, one county hospital in Tennessee could not supply financial data. The National Institute of Mental Health estimated maintenance expense for this hospital by applying the per patient maintenance expenditure for 1955 to the average daily number of resident patients reported for 1956. No other estimates were made by the institute.

It is interesting to note that in 1955, even though the survey was conducted one month later than in 1956, nine States were unable to report complete data whereas complete reporting was obtained for 1956. The estimates published for the 1955 survey compare closely with the final data for 1955 presented in the table. The percentage error in the estimates for each category follows: first admissions +1.1 percent; readmissions, -0.8 percent; discharges, -0.5 percent; deaths, +0.2 percent; resident patients, +0.2 percent; personnel, -0.3 percent; total maintenance expenditures, +0.7 percent and per patient expenditures +0.6 percent. In view of these small differences and the fact that all data for 1956 were supplied by the States, it is likely that these 1956 data are very close approximations to the final figures which will be available at a later date.

*Prepared by the Hospital Reports and Records Unit,
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tional Institute of Mental Health, Public Health
Service, Bethesda, Md.*

In western North America, the California little brown bat, *M. californicus*, is represented by four subspecies, which range from southern Alaska to southern Mexico. *M. californicus* is a small insectivorous bat of uncommon occurrence. Hall (2) found the species in Nevada hibernating in mine tunnels. Little is known of its habits or its distribution in Montana.

The second infected bat, identified as *Eptesicus fuscus pallidus*, was collected alive by a 10-year-old boy, who found it along with a dead bat on the floor of an unoccupied house in Hamilton. He adopted the bat as a pet, but the next day it died. When the child brought the dead animal to the laboratory, he was questioned carefully but denied having been bitten.

Information on *E. fuscus pallidus* is included in our 1955 report on chiropteran rabies (1).

The third infected bat, *Lasiurus cinereus cinereus*, was collected by one of us at Flathead Lake in northwestern Montana. As he was standing near the shore of the lake in open pine woods in bright daylight (6 p. m., August 18, 1955), his attention was attracted to a fluttering bat overhead. The bat flew in a direct line toward a large tree, which it struck without slackening flight. The animal fell to the ground, but it was conscious and squeaked when approached. He killed the bat with a light stick and kept it in a frozen food locker until it was taken to the laboratory.

The hoary bat, *L. cinereus cinereus*, is the largest of the bats found in the Pacific Northwest, but it is also a rather rare species. Its range includes almost the entire United States and southern Canada and northern Mexico. Davis (3) has recorded only a single specimen from Idaho. Dalquist (4), who mapped only seven collection records for the species in Wash-

Table 2. Characteristics of rabies virus after serial passage in mice

| Bat virus No. | Mouse brain passage | Incubation period ¹ (days) | Titer of virus ² | Mouse brain passage | Incubation period ¹ (days) | Titer of virus ² |
|---------------|---------------------|---------------------------------------|-----------------------------|---------------------|---------------------------------------|-----------------------------|
| 1----- | 1st-- | 6 | 4.4 | 3d--- | 7 | 3.0 |
| 2----- | 1st-- | 18 | 3.4 | 5th-- | 7 | 4.5 |
| 3----- | 1st-- | 7 | 4.8 | 8th-- | 8 | 4.5 |

¹ Ten percent suspension injected.

² Log of the number of LD₅₀ per 0.03 ml. of brain tissue.

ington, states that information on the natural history of the hoary bat is meager. He further states that the hoary bat is migratory and leaves Washington in August and September to winter along the coast of central and southern California. Although *L. cinereus cinereus* is largely a forest-dwelling species, Durrant (5) writes, "I have taken specimens by shooting over desert water holes."

Some characteristics of the three isolates of rabies virus are noted in tables 1 and 2.

Although Negri bodies were found in microscopic sections of the brain of each of the three bats (table 2), there was no evidence of inflammatory changes in the material available for study. Negri bodies were most numerous in the single specimens of *E. fuscus pallidus* and *L. cinereus cinereus*. Both Negri bodies and inflammatory lesions were found in the brains of first-passage mice. Titers of virus and incubation periods in first and subsequent mouse-brain passages are shown in table 2.

Rabies antiserum was prepared in this laboratory with the National Institutes of Health-Pasteur strain PV-1 as an antigen. The serum was used in neutralization tests against the PV-1 virus, the rabies virus isolated in our 1954 bat studies, and the three strains isolated in this study. As a control, the serum was also used against a virus isolated by Dr. Harald Johnson from a bat and known not to be rabies. The serum neutralized all viruses to titer except the one obtained from Dr. Johnson. There was no evidence of reaction with the latter virus.

Discussion and Summary

Three of the 127 bats, comprising 7 species, collected in western Montana for the Rocky

Table 1. Characteristics of rabies virus isolated from three naturally infected bats

| Bat virus No. | Negri bodies in brain of bat | Negri bodies in first mouse passage | Incubation period (days) | Titer of virus ¹ |
|---------------|------------------------------|-------------------------------------|--------------------------|-----------------------------|
| 1----- | Present---- | Present---- | 9 | 4.0 |
| 2----- | Present---- | Present---- | 10 | 6.1 |
| 3----- | Present---- | Present---- | 9 | 3.6 |

¹ Log of the number of LD₅₀ per 0.03 ml. of brain tissue.

A Survey of Chiropteran Rabies in Western Montana

By J. FREDERICK BELL, M.D., W. J. HADLOW, D.V.M., and WILLIAM L. JELLISON, Ph.D.

IN an earlier report from the Rocky Mountain Laboratory of the Public Health Service, Hamilton, Mont., we described the isolation of rabies virus from a bat caught in Ravalli County, Mont., in the late summer of 1954 (1). The lateness of the season limited collections in that year. However, in 1955 we made further attempts to isolate rabies virus from the bats obtained during field trips and by contributions from local residents.

Usually, bats were collected from roosts in attics with the gloved hand or were taken with forceps. Several infected bats were collected under circumstances which we will describe.

In the laboratory one lateral half of the brain of each bat was triturated in sufficient 1 percent albumin-saline diluent to make approximately a 5 percent suspension. A preliminary test for infection was done with each suspension by injecting each of 6 mice intracerebrally with 0.03 ml., and the remainder of the suspension was frozen. When the screen test was positive, the preserved suspension was centrifuged, and the supernate was titrated in mice. The other

half of the brain was fixed in Zenker's fluid for microscopic study.

Rabies From Three Species

One hundred twenty-one apparently normal bats were collected alive in routine collections in various parts of Ravalli County. The numbers of the various species examined are tabulated:

| | |
|---|----|
| <i>Myotis humanensis</i> | 14 |
| <i>Myotis lucifugus</i> | 47 |
| <i>Myotis humanensis</i> or <i>Myotis lucifugus</i> (juvenile)..... | 17 |
| <i>Myotis volans</i> | 3 |
| <i>Myotisotis</i> | 1 |
| <i>Myotis californicus</i> | 1 |
| <i>Eptesicus fuscus</i> | 37 |
| Unidentified..... | 1 |

These bats were brought to the laboratory and held in captivity a day or two until it was convenient to test them. None of their brain tissues produced rabies in mice.

Six other bats exhibiting aberrant behavior or found in unusual situations by people who knew of our 1954 findings were submitted for examination. Three of the six bats were rabid. The circumstances under which these three bats were collected are as follows:

A housewife in a small town about 6 miles from the laboratory brought the first infected bat, *Myotis californicus californicus*, to our attention. She said that her dog had bitten a sick bat, which was dead when a messenger arrived to collect it. The dog remained well during a 3-week period of observation.

The authors are, respectively, senior surgeon, pathologist, and parasitologist with the Rocky Mountain Laboratory, National Institute of Allergy and Infectious Diseases, Public Health Service, Hamilton, Mont. Dr. Charles O. Handley, Jr., of the Division of Mammals, United States National Museum, Washington, D. C., identified all the bats examined. The museum retained the infected specimens for reference purposes.

The State of the Nation's

public —
health —
services —

Abridged reports from the 55th Conference of the Surgeon General of the Public Health Service and the Chief of the Children's Bureau with the Association of State and Territorial Health Officers, the State Mental Health Authorities, and the State Hospital and Medical Facilities Survey and Construction Authorities, November 2-10, 1956, Washington, D. C.

New Highways To Health

**By Leroy E. Burney, M.D.
Surgeon General of the
Public Health Service**

Would that we health experts had the same precise knowledge in our field as the Nation's highway planners. For without it, we cannot plan new highways to health which would extend through all the States at the same rate of progress and standards of quality, and which would, by the very boldness and imaginativeness of design, capture public support.

I am not suggesting that we don't know what's going on in our own shops. Few public services have made as conscientious and unceasing an effort as public health agencies to collect and analyze reliable data pertinent to their statutory responsibilities.

But most of the facts that we have at our fingertips relate to the organizational structures, types of services, and ratios of professional personnel and facilities for a population of some 130 million in the social, economic, and physical environment of 20 years ago. Let's take a look ahead.

We need facts pertinent to a population of some 168 million today, 180 million in 1965, and 200 million by 1980. We need to see our organizations, services, personnel, and facilities

Continued on page 21

Mountain Laboratory of the Public Health Service, were found to be infected with rabies virus. The infected bats were *Myotis californicus californicus*, *Eptesicus fuscus pallidus*, and *Lasiurus cinereus cinereus*.

It is noteworthy that none of 121 bats collected while roosting were infected whereas 3 of 6 bats that exhibited abnormal behavior had rabies. The titers of virus in the brains of mice infected with the 3 strains were rather low and remained low even after several passages. Stamm and his associates (6) found the same to be true of one Florida bat strain. The three isolations from bats were the only isolations of rabies virus in Montana in 1955.

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FDA Renews Hoxsey Warning

The Food and Drug Administration is intensifying its efforts to warn cancer patients and their families against the Hoxsey treatment for internal cancer. Help in disseminating the official United States Government warning is sought to offset increased promotion of the "treatment" launched following an adverse ruling against the Hoxsey clinic at Portage, Pa.

Information has been received that additional Hoxsey clinics are planned in other States. Hoxsey supporters are soliciting funds to "pay expenses" and "fight the medical trust."

On November 15, 1956, a Federal court jury at Pittsburgh sustained FDA charges that a half million pills seized at the Portage clinic were misbranded because they are of no value in the treatment of cancer. During the 6-week trial 80 witnesses, including some of the world's outstanding cancer experts, testified for the Government. Their evidence showed that persons claimed to have been cured by the Hoxsey medicines have since died of cancer; that others did not have cancer at all, while

still others were effectively treated by X-ray or surgery before taking the Hoxsey treatment. It was indicated that some users may have died of cancer because they relied on the Hoxsey treatment instead of seeking competent medical care in the early stages of the disease.

For more than 30 years Harry M. Hoxsey has made false claims for his liquid medicines and pills, and thousands of users have been deceived in spite of numerous local and State court actions.

Following the official public warning last April, FDA inspectors reported a very substantial decline in patients at the Portage, Pa., and Dallas, Tex., clinics. During the ensuing 7 months an estimated 3,000 to 6,000 persons were dissuaded from patronizing the clinics.

Copies of the FDA public warning may be obtained by writing to the Food and Drug Administration, Washington 25, D. C. A shorter public notice is also available for use in local newspapers, shopping news, farm, fraternal, and religious publications, or as a basis for radio or TV announcements.

for this larger and increasing population in entirely new settings: A rising standard of living, new patterns of urban and suburban life, larger families, more older people. Increasing automation, with consequent shift in the types of occupation and conditions of work. Emergence of entirely new industries. More cars, more trucks, more planes. Atomic power, much sooner than imagined. Increasing costs of hospital services, coupled with increasingly effective diagnostic and therapeutic techniques in the hands of the practicing physician. Increasing numbers of individuals and families seeking, but not finding, new types of health services in their communities.

We have some general concept of the gaps in our health programs. But a gap is not the sole measure of deficiency. We need to identify the causes of obsolescence and seek earnestly to remove them. It is not good business or good public health practice to hold on to obsolete procedures and activities.

We should address ourselves to this kind of appraisal, agonizing though it may be to some professional groups in public health practice. Our shortages of professional personnel are indeed vast. But, in our preoccupation with the estimated needs and no relief in sight, we have almost convinced ourselves that only more of the same will correct the deficiencies of our programs. On the contrary, we have at least two good alternatives: more effective use of professional public health personnel and the employment of other specialists and subprofessional groups.

Over the past 24 years, the American Public Health Association has sought earnestly to raise the standard of educational qualifications for the numerous specialty groups that make up the public health profession. In practice, however, too many of those who meet the qualifications are kept on outmoded activities which make no demands on their hard-won skills, have no use for their creativity, their burgeoning ideas. Too many are burdened with routine administrative tasks for which they have not been, nor should have been, trained.

Liberating Creative Powers

While pressing forward with every financial and educational resource at our disposal to in-

crease the supply of professional public health personnel, let us henceforth put a high priority on liberating the creative powers of our present and future staffs. Their ideas and imagination, tempered in the fire of meaningful experience, are what we need to design and build the new highways to health.

How then to remove the burden from overworked people who can't think, simply because there is no time to think? I have no ready answers to the question: no one individual can produce the best answers.

For what it's worth, however, try this on for size. If you had one or more specialists in public administration to share your burden of organizational and administrative planning and execution, or even enough administrative assistants to deal with the details of fiscal and budget matters, personnel administration, and so on, how much more time would you have to meditate: To meditate on the incalculable present and future problems in your area? To work and plan with your counterparts in State programs such as welfare, education, rehabilitation, housing, rural and industrial development? To consider with your fellow State health officers in nearby jurisdictions the urgent regional health problems of common concern?

We have made a little progress in accepting the idea of using less highly qualified nursing personnel as a means of conserving the skills of our scant supply of public health nurses. Clinic nurses and practical nurses are being employed in local health departments with increasing frequency. But, nationwide, we haven't employed nearly enough, or nearly enough clerks and clinic aides to allow public health nurses to serve the community as widely as they could if they did not also have to be record clerks, receptionists, and housekeepers.

Is there a possibility that all local health departments could benefit by the help of a volunteer group, something akin to the Gray Ladies of the American National Red Cross?

Perhaps some of the other health department programs, besides public health nursing, could use the services of volunteers. We are urging community surveys to get the facts upon which to base the needed modernizing of our programs. There are many jobs in community

Federal-State Cooperation: 1903-1956

The evolution of the Surgeon General's Conference with the State and Territorial health officers illustrates the durability of Federal-State cooperation in an ever-changing field. We are fortunate that Federal-State cooperation has been the usual order of business in public health for so long. This conference, established by law in 1902, antedates the provision of any regular mechanism for Federal-State cooperative planning and action in other matters of civil policy. It is still unique in that it is the only instance in which the entire body of State and Federal officials in a given field work together under law in an organized way.

Amendments to the Social Security Act Inter established an annual conference of the Chief of the Children's Bureau with the State and Territorial health officers. Then in 1916, the Public Health Service Act of 1914 was amended to require the Surgeon General to confer with State and Territorial hospital and mental health authorities. Since that time, we have had a joint conference of the Public Health Service and the Children's Bureau.

The broadening of these conferences reflects more than the broadening interest of the Federal Government in health. It reflects the broadening responsibility of the States and the notable strengthening of State and Territorial health programs. It also reflects many underlying and striking changes in health needs.

Let us compare, briefly, the first conference, in June 1903, with the 55th conference. The first conference met only one day. Twenty-two States and the District of Columbia were represented. In his annual report to Congress, Surgeon General Walter Wyman said of this meeting: "The delegates in turn gave synopses of the laws under which their respective boards (of health) operate, and a resolution was adopted favoring the formation of committees on special diseases and special consideration of such questions relating to the same as might be referred to them by the Surgeon General."

Those committees were on the following topics: scientific research and sanitation; prevention and spread of epidemic diseases; morbidity and mortality statistics; State legislation; and education. Subcommittees were appointed to report on cholera, yellow fever, plague, smallpox, tuberculosis, leprosy, and typhoid fever. It was agreed that resolutions of

future conferences were to be based on committee reports.

Fundamentally, that procedure has not changed. But what a difference today in composition and major topics of interest. The health officers here represent the 48 States, Alaska, the District of Columbia, Hawaii, Puerto Rico, the Virgin Islands, and Guam. Most are accompanied by program directors in one or more of the following fields: hospital and medical facilities, mental health services, maternal and child health and crippled children's services.

Through the Association of State and Territorial Health Officers, 7 permanent standing committees and 3 special committees have been in session and will present recommendations to the Service, the Children's Bureau, or to the association. It is noteworthy that none of the committees is concerned with one specific disease. Our concerns today are focused on Federal-State relationships, on broad categories of services and facilities needed for better health, and on people—mothers and children, American Indians, and migrant workers.

You have only to glance at the volume of the agenda to realize that this is a year-round working conference. Our Federal-State communications system is much more efficient. For this, we owe thanks to the association, its executive committee, the regional staffs of the Service, and the Children's Bureau.

There is another change. At that first conference and many thereafter, the initiative clearly came from the Public Health Service. Today, more often than otherwise, the initiative comes from increasingly vigorous and aggressive State and Territorial health departments.

I do not relinquish thereby one iota of the Public Health Service's responsibility for aggressive leadership. But we have only to glance at the international news to realize that exclusive leadership is the loneliest, the most sterile, and the least permanent. It is because our country has joint leadership in public health—Federal-State cooperative leadership—that all of us can undertake our individual and collective responsibilities with confidence and hope.

—Excerpts from the opening remarks of
SURGEON GENERAL LEROY E. BURNET.

forded most of us by our good will toward man and our intuition.

The community is our field. Here we must demonstrate the value, and the very reason for being, of public health and preventive medicine, or we fail. And the community is not so many square miles of structures, so many sewer lines and water pipes, so many birth and death certificates and case reports. The community is people of all ages, of all sorts and conditions, and they all behave not only as individuals but as groups, bound in many and widening circles by common beliefs, attitudes, and needs.

We often draw an analogy between the role of the personal physician and the local health officer. We say that as the former is responsible for diagnosing and treating the individual patient, using the services of specialists when they are needed, so the latter bears a like responsibility to the community. If this be so, I would say the local health officer needs a consultant in behavioral science perhaps even before he begins to diagnose, and certainly before he institutes any form of therapy requiring the acceptance, consent, and action of any sizable part of the community. If some of you think I go too far along this line, there is a growing experience and literature to bolster my contentions. Take a look, for instance, at "Health, Culture, and Community," edited by Benjamin David Paul. You will find these studies, some drawn from our own American society, illuminating and stimulating.

Medical and Related Research

That mention of studies reminds me that I have said nothing so far about medical and related research as a prerequisite to modernizing our highways to health. Perhaps this is because so much has already been said that some of us begin to think that all the basic and applied answers to our major health problems must be found before effective changes in services and programs can be made. We want, and must have, research and application going forward shoulder to shoulder.

Let me say that the Public Health Service will do everything in its power to promote and assist the development of research in, by, and with State and local health departments.

By and large, the findings of the past decade have found swifter, more widespread application in medical practice and hospital care than in public health programs. There is a special bridge that needs to be built to give us the needed shortcut. And that bridge is the kind of operational research that health departments are eminently suited to undertake. Actually, many of the questions I have been raising can be answered only by careful studies.

Also, our health departments must take a much more important part in epidemiological research than they have been taking. Some of you may recall Dr. Joseph Mountin's statement: "The health department is the only place a young physician can study healthy people along with the sick." The same could be said of the medical research scientist. The study of human biology and pathology in its natural setting, the human community, is indispensable. The principles of epidemiology have been developed and applied to parts of that essential study by public health scientists as their profession's unique contribution. Our major contemporary health problems present a challenge to epidemiology, no less than to experimental and clinical research. Our health departments should join with their scientific colleagues in taking up that challenge.

Besides the unquestioned additions such studies will make to public health knowledge and methodology, we shall realize untold benefits in removing one of the major causes of obsolescence in our health programs. And that is the isolation of many State and local health staffs from the stimulus of scientific inquiry and fruitful contacts with academic and research institutions. I see cooperative research, involving health departments with universities, or schools of public health, or medical schools, or the Public Health Service, as an aid to recruitment such as we have not had in years.

The few issues I have discussed by no means cover the gamut of problems we face together nor the victories we have shared. They have seemed to me especially important at this point in time, when the future strength and competence of our Federal, State, and local health departments seem especially vital to our Nation.

Someone has said that "ideas are the life of a people." The effective planning and develop-

surveys for specially trained and disciplined volunteers. They would never lack work to do in a local health department, I warrant.

In the same connection, can we use our personnel, facilities, and funds at the local level more efficiently by doing some of the essential jobs regionally and with more automation? Modern means of communication and our great new system of highways are leveling the road-blocks of time and distance. We should use these facilities to help break some of public health's traffic jams. I am thinking especially of local laboratory services and statistical programs. Perhaps we could have more specialists in local health services if we were willing to regionalize these activities.

Meantime, the Health Amendments Act of 1956, which became law (P. L. 911, 84th Cong.) on August 2, 1956, has made a good start toward increasing the supply of professional public health personnel, nurse educators, nursing supervisors and administrators, and practical nurses. By October 31, 32 schools of nursing and graduate schools of public health had applied for grants under title 1 of the act. The number of traineeships requested far exceeded our expectations, and even further the resources, \$1 million, available for this year. For example, we have been able to approve only 130 of 276 traineeships in public health nursing requested by the nursing schools, and only 47 of the 84 traineeships requested by the schools of public health. In addition, the Service has awarded 89 individual traineeships.

In the program for the advanced training of professional nurses under title 2, we have proceeded along the same lines. The 1957 appropriation for this program is \$2 million; grants are made to schools only. By October 31, grants had been awarded to all 56 eligible schools, covering traineeships for 553 students. More than 400 traineeships requested could not be awarded for lack of funds.

The training program for practical nurses is administered by the Office of Education of the Department of Health, Education, and Welfare. Two million dollars has been appropriated for traineeships, which will be awarded in the form of grants to the States. For every \$1 made available by a State in its expanded practical nurse training program, the Federal Gov-

ernment will grant \$2 to provide traineeships, up to a total Federal expenditure of \$2 million this year. A commissioned nurse officer of the Public Health Service has been detailed to the Office of Education as a consultant in the practical nurse training program. A citizens advisory committee is being assembled to help in the administration of the program, and nursing consultants are being employed to aid in expanding enrollments in practical nursing schools.

These new Federal programs to help augment the supply of health personnel by no means reduce, but possibly increase, the needs for inservice training at every level—national, State, and local. The simplest types of inservice training are those concerned with the use of new techniques and new equipment. The application of the cytologic test for preinvasive cervical cancer is a case in point. So also is the use of air pollution detectors and a host of other new techniques which could be widely applied if more subprofessional personnel were trained to do those parts of the procedure within their competence.

At professional levels, broad orientation in certain new problem areas must be provided on the job or in regional short courses for staff members who completed their academic training before the information now available had been developed. I have in mind such fields as radiological health, up-to-date civil defense and disaster relief, and regional development.

Understanding of Human Behavior

In all our tooling up to design new highways to health, we should recognize our public health profession's need for some orientation, some training in the behavioral sciences. The day will come soon when many State health departments will have a specialist or two from the fields of psychology and cultural anthropology on their permanent staffs or as frequently used consultants. The few that now have such specialists and we in the Federal agencies will learn to use their services more effectively. For it should be clear to all of us by now that the health programs of the future will lead nowhere if they are not based on a sounder understanding of human behavior than is af-

training centers where it appeared that need existed. The universities and the teaching centers historically have served as bases for training people. At the outset, we found these centers, as a whole, needed improvement, both financially and programwise. Accordingly, the institute gave high priority to grants for this purpose.

The grants program was initiated in 1947. In the years since, the institute has made grants to medical schools to improve or expand psychiatric instruction to the medical student. During fiscal 1956 alone, grants were awarded to 72 of the Nation's 84 medical schools. This aid means that 26,000 of the total 28,000 medical school students will receive more and better psychiatric instruction, to enable them to deal more effectively with the emotional problems of their patients.

Grants in another area have been directly responsible for the inauguration of mental health curriculums in 6 of the 10 schools of public health. Moreover, teaching centers for psychologists, psychiatric social workers, and psychiatric nurses have come in for their share of grants from the institute. Another technique sponsored by the institute to encourage well-rounded training is the series of regional conferences for professors of psychiatry in medical schools in the west and the south.

About 4,000 individuals have received stipend support for training during the 10 years the grants program has been operating. During fiscal 1957, 440 training grants, including 1,800 stipends, will have been made.

This, admittedly in brief, is the picture of support for mental health training at the national level. All of us, I think, can be justly proud of the progress and the accomplishments to date. At the same time, all of us know that the numbers already trained do not nearly approach the total need. The institute has never felt that it could or should singlehandedly take care of the vast training needs for the entire Nation.

The responsibility is a joint concern. It seems that the States recognized and acted on their training obligations a few years ago to a greater extent than they do today. In 1948, in the early days of the grants to State programs for mental health, the record shows that

the States used no less than 14 percent of available funds for preservice training of personnel. But in 1955, only 2 percent of State funds were spent for this purpose. In actual dollars, State expenditures dropped from \$840,000 in 1948 to \$360,000 in 1955.

One conclusion to be drawn from these figures is that the States' outlays for training in recent years are negligible amounts when compared with 1948 records. Less and less money is being spent by the States for training people in spite of the fact that the need to give services has skyrocketed. The demands for services everywhere grow greater, mental health centers are planned and funds for personnel are available, but the mental health workers are not to be found at any price.

Need for Trained Workers

I appreciate the constant and continuing pressures you face. But we must keep training in proper perspective. When many of the State programs were getting started, people were trained because they were a sheer necessity. Without the trained workers, programs could not develop beyond a certain point. There are limits to how far workers can be stretched to cope with community mental health needs. For the improved programs the public is demanding, more and not fewer workers must be trained.

We can begin to come to grips with the need for trained workers by looking at the training centers and the areas which more nearly approach their manpower needs. What is it about certain training centers that attracts residents and well-prepared faculty members? Location of the center is high on the list of desirable characteristics. The individual should have access to adequate and ample reference material. He has opportunities for professional growth through participation in research, for work and contact with influential teachers in many fields of learning. The element of prestige in such an environment cannot be overlooked. The trainee's or the faculty member's working conditions are much more satisfactory. He has smaller patient loads, with all that this implies for adequate supervision. Time off for clinical work and for supervision in special

ment of our health services is no less dependent on ideas. And at the present time of transition, no idea is too simple to be unworthy of a trial. We cannot build health highways by talking, but only by putting ideas to work. This means that top level health officials must be receptive to ideas, even to ideas that suggest the abandonment of obsolete procedures and activities, the development of new programs and methods of organization and staffing.

NOTE: The full text of Dr. Burney's address included a section on aging that appeared in the December 1956 issue of Public Health Reports, p. 1168.

Training Mental Health Personnel

By Robert H. Felix, M.D.
Director, National Institute
of Mental Health,
Public Health Service

The serious need for trained mental health manpower is one matter that necessarily occupies much of our time and energies. This area of concern was uppermost as long ago as 1946, when State and Territorial health officers and State mental health authorities met in joint session for the first time in the history of the Public Health Service. We have struggled with the problem in the ensuing 11 years, and today it is still with us in greater proportions than ever before, in spite of the thousands of people who have been trained, because mental health activities on all levels are increasing.

The requirements for more trained people are evident in all parts of the Nation. Some specific information on the situation in one section of the country with regard to one class of personnel will help pinpoint the problem. I am referring to the data on the resources and needs in the 16 southern States, provided by the survey conducted in 1954 by the Southern Regional Education Board. The survey findings resulted in the estimate that the south needs 4,260 psychiatrists for all purposes, or more than 5 times the number it has now. The

shortages of other workers are equally acute: 7 times as many clinical psychologists, 5 times as many psychiatric social workers, and upward of 5 times more psychiatric nurses than are available.

A closer look at the survey findings reveals that only 272 psychiatrists were expected to be trained in the entire south during the 3 years following the study. In other words, the south in 1957 will still be faced with a shortage of about 4,000 psychiatrists. At that rate of training, it would take many years to obtain the needed psychiatrists, and in the meantime the number required undoubtedly would increase considerably.

The comprehensive survey of the Southern Regional Education Board took into account the personnel required for public programs at all levels, as well as those for private practice and for training-center facilities. We have looked around us, and we know that, while the training centers and the urban areas have their problems with regard to shortages of personnel, they are relatively in a much better position than are other programs. By far the greatest number of staff vacancies exists in State programs, in the community mental health clinics, and in the mental hospitals. The teaching center, for example, may need only an additional man or two to round out its program. Many operating programs, on the other hand, may need one or more professional mental health personnel to initiate activities or to replace its part-time activities with full-time services.

Far too many mental hospitals are struggling along with grossly inadequate staffs. We estimate that the hospitals have only about one-half the number of psychiatrists they should have to provide adequate treatment for the patients under their care. The deficit of nurses, psychologists, and social workers is even greater.

Grants Program of Institute

The support and encouragement of training has been a vital phase of the National Institute of Mental Health's activities. Our approach has necessarily stressed support for the existing centers of learning. At the same time we have tried to stimulate the development of additional

The system of associated psychiatric faculties is employed to facilitate this integration of learning centers, hospitals, clinics, and other agencies for training. In many cases, the institution's staff helps out with didactic instruction in the training center's program.

The varied background which this kind of training provides is the kind of orientation State and community mental health personnel need. I wish I could report that all of our young people are receiving this kind of training, but we know all too well that they are not. Indeed, I am amazed and surprised at the vast differences in training one observes in one institution or another. Trainees in psychiatry, for instance, may be quite effective in working with psychotic patients but know little or nothing about working with schools and community agencies.

I am not, of course, opposed to highly specialized psychiatrists or other workers. We need this kind of personnel also. I am saying, however, that training is not equipping many people to do the community mental health work they have chosen. Their formal training does not give them the experience for the problems they inevitably meet. The omissions in instruction are understandable when we consider that some teachers are themselves handicapped in the same way. They, of course, pass their blind spots on to their students.

Both the trainee and the teacher, then, need a knowledge of the community's organizations and its institutions. I cannot help wondering how many psychiatrists have started careers in clinics, for example, only to become uncomfortable at finding themselves unprepared, and have turned to private practice instead. Integration of institution staffs and the training center faculties is one remedy for this situation, and each group will derive help from the other.

Regional Network

The States can derive tremendous benefits from such cooperation. I can think of one State hospital which until recently was a fairly typical mental institution, short of staff, training programs, and research projects. Now it has more applications for residencies than it has vacancies. The reason for this brightened pic-

ture is participation in a training network that embraces the State university, a good clinic, a Veterans Administration hospital, and other agencies.

Many of the States are equipped to develop fertile fields for training within their boundaries. All that is needed is a central plan and the establishment of the necessary cooperative relationships. One State has two medical schools, and one of these has a very good psychiatric unit. Each school is relatively near a mental hospital. Both hospitals, in turn, are good ones and one of them is new. Also, a good child psychiatric center offering residential treatment is located in the same city with one of the medical schools. This particular State could undoubtedly arrange for cooperation between its training centers and its institutions in the very near future.

I cannot tell you that the job will be a short or easy one, for the whole training problem is long range. Now is the time, however, for action on realistic training programs designed to meet our needs. I would strongly urge the establishment of a working group of this association, to consider specific plans for the development of cooperation between training centers and your operating institutions and agencies. The National Institute of Mental Health stands ready to provide all possible aid.

I envision the goal of your training activities as being the development of a central recruitment and employment source within the State. Communications between States and training centers by way of regional State groupings, such as the Southern Regional Education Board and the Western Interstate Commission for Higher Education, could speed the realization of such sources. Anyone within the State could turn to the central source for personnel needs, and the State would be prepared to refer to sources for trained workers.

We are not the only ones who are wrestling with the need for more mental health personnel. State legislators throughout the Nation are also searching for solutions. I have talked with many of them, and I know that they are looking to us for leadership.

The American Psychiatric Association, as well, is deeply concerned with our needs. At the fall meeting of APA's council, I pointed out

areas can usually be arranged. If he wishes, the individual may branch out into fields other than his own, and the total environment provides stimulating intellectual contacts.

Obviously, then, the answer to some of our manpower problems lies in bridging the gap between the training center and the State programs. Is it possible to initiate developments designed to create some of the same advantages the training centers have? You can do all in your power to influence the location of proposed new hospitals near universities. You can work to set up research units within your hospitals. Faculty arrangements and exchanges between universities and hospitals and mental health centers can be worked out. From time to time, opportunity can be given staff of these installations to take additional work at the university or under faculty supervision. Seminars can be arranged through the training centers and authorities from outside the State can be brought in periodically.

There is considerable advantage, both to the individual and to the program, for continuation of training on the job or on an intermittent basis after the period of formal preparation is completed. Professionals in the mental health field are usually trained in psychiatry, psychology, public health, social work, or nursing. Usually, these people come to the job as representatives and protagonists of their particular discipline, and with all of the biases and narrowness such training usually produces. What is needed in mental health work is not a collection of specialists brought together to practice their professions but rather a staff who bring a variety of skills which, taken together in proper proportions, will be much more likely to result in the best solutions. Unfortunately, this attitude is rarely developed in a training center, but the need for this point of view usually becomes apparent rather quickly once the worker begins to apply his training on the job. With the realization of this need, there is motivation for a broader and more useful type of training. When opportunity is provided to meet this need, one can look forward to a much better integrated and useful staff.

In addition to the advantages, inservice training has a byproduct which may be more valuable for the future than the original purpose of

providing better preparation for people already employed. The training centers are brought to realize wherein they are falling short in preparing their students, and with continued pressure applied by the students and the agencies which employ them, it is much more likely that the centers will provide the needed training either in the regular curriculum or in special courses.

It seems that these are activities in which States and communities can properly and profitably invest money and energy.

Community Health Work

How are we going to get people to take training, and also, how do we obtain the necessary qualified people to do the training? The motivations, of course, are not necessarily the same in all disciplines within the mental health field. Also involved are the clinics and hospitals and whether they are motivated to provide adequate and acceptable training, or, if unable to do this, to provide training in certain areas which can better be obtained there than elsewhere. We must recognize that the hospital which is far removed from the training center may not be able to obtain many new residents in psychiatry, for instance: but, while the institution may not be able to provide all a student's necessary training, it may well be ideal for providing experience and supervision in special segments.

Where an institution carries on an active program of research in special areas, it can often develop a rather wide reputation, and if this program is really excellent, there will be demand for opportunities to spend some time there. Some such special areas are aging, mental retardation, alcoholism, rehabilitation programs, programs with the schools, and closely integrated hospital and community programs.

This is what is actually happening in some places where State and community hospitals and extramural programs are integrated with training centers. There are numerous possibilities to obtain training in a variety of settings. Students, for example, may wish to obtain some supervised experience in the penal system or in another type of institution such as the juvenile court although they might balk at spending the entire training period there.

carry responsibility for children would have in a usable form the viewpoints, findings, and implications of studies of child rearing, child care, adult-child relationships, and of family and community provisions for children which appear to have a bearing on healthy personality growth and development.

Second, not only must we make more effective use of the research and clinical information we have, but we must broaden tremendously our knowledge about mental health, its cultural, personal, and environmental foundations, and its sources.

We need to know much more about the sources of emotional strength that help children withstand the inevitable destructive influences that make for mental and emotional disturbance. Greater understanding of these main-springs of mental health is a crucial part of the equipment of professional workers serving parents and children, and only research can supply it.

At the same time that we advance along the path toward the prevention and cure of mental illness, we need to test the knowledge we have and the knowledge we gain by evaluative research that will tell us to what extent the programs and services offered in these fields are effective.

More evaluative research must also be undertaken to give us a better picture of our successes and failures in maternity clinics, child health conferences, and school health services, in the use of the group process for helping parents, in the methods used by private physicians, in the care of children in hospitals, in institutions or foster family homes. With new and clarifying guidelines that could be derived from such studies, our work could be greatly improved.

Third, ways and means must be found to include in the teaching programs of schools of medicine, public health, nursing, social work, and law much more theoretical and practical instruction in child growth and development than is now included.

Recently, a prominent child psychiatrist stated that, for about 80 percent of emotional problems of childhood, care from psychiatrically trained personnel would not be needed. He believes that pediatricians and public health personnel could handle most of these problems

if they had adequate training in the development of children. In view of the continued overcrowding of child guidance clinics, it appears essential that nonpsychiatrically trained personnel learn to handle more effectively the more superficial problems.

What is needed to help bring this about is the introduction into schools of medicine, nursing, public health, social work, and other educational programs of an adequately supported teaching program covering the essentials of total child growth and development, and an understanding of interpersonal relations. Already some departments of pediatrics have begun to do this. Certain schools of public health nursing and schools of social work have also enriched their curriculums in this way. I regard such a training program as a vital undertaking and one that should have the support of all concerned with the business of child rearing.

I have dwelt somewhat at length on the need for this training program because of its long-range implication for the health of children and youth and because of its significance in any and every effort to advance toward a real base for peace.

At this point I would like to refer briefly to a few items of interest that have importance for the future.

Radiological Health

A few months ago, a document of great significance to child development and to the population as a whole was published. I refer to the report of the National Academy of Sciences-National Research Council on "The Biological Effects of Atomic Radiation." The most striking aspect of this report is the relative importance for our population of cumulative exposure to X-ray and fluoroscopy. As you know, the human embryo, the fetus, infants, and children are especially sensitive to X-ray radiation. The results of radiation may range from genetic mutations in succeeding generations when the gonads are exposed, to embryonic damage when a pregnant woman receives excessive dosage on the pelvic organs, to damage to the blood-forming organs with resulting leukemia when radiation to the whole body is excessive.

the obligation of organized psychiatry and teachers to provide the necessary stimulation and experience for public mental health workers.

Our States and the psychiatric facilities are dynamic entities, ever on the move to accomplish their objectives. Foremost among their more immediate goals should be the development of cooperative relationships for more realistic and appropriate training. The goal of fertile training soil for our mental health personnel-to-be is surely worthy of our best efforts.

Perspectives In Child Health

By Martha M. Eliot, M.D., Sc.D.
Former Chief of the
Children's Bureau

I am glad to be with you once more and to report to you on some activities of the Children's Bureau during the last year.

No one here has to be told what a long way we have yet to go before we attain that level of physical, mental, and social maturity that enables people to solve international problems *without resort to armed conflict*. Many of you would agree with me that we have made some progress, even though small, in recent years toward this goal. But may I say to you, who are the leaders in the field of health, that the contribution to that progress which you can make in the years ahead is tremendous.

If you ask me what you should do, my answer would be, look sharply and long at what each of you and your colleagues are doing to start a whole new generation of children on the road to healthy development, not just in body but in total personality. This calls for a generation of parents who understand more fully than most do now the meaning of their relationships with each other and with their children. It means a generation of parents who accept as fact what Dr. Brock Chisholm some years ago called "the most important business in the world, the one that outweighs all other values

in the world," the business of rearing children.

Basically, it means that all professional persons coming in contact with parents will themselves require an understanding of what is meant by healthy personality development in a child and how it is brought about. Often, an early contact, even before the birth of a baby, may be made by a child welfare worker, a teacher, a minister, a lawyer, a nutritionist, or by other health and welfare workers. But the role of child health workers—physicians, nurses, and many others—is of primary importance, for it is usually they who, year after year, will have the opportunity to make the earliest contact with young parents who are new to this business of child rearing.

Support for Professional Workers

It is an important matter, then, that we should be constantly seeking ways to help professional workers understand the facts and the meaning of child growth and development and how each child is affected by the family environment into which he is born, by the biases and discriminations of the community in which he lives, by his physical and mental handicaps, and by many other factors.

If professional workers are to proceed in their activities with confidence that what they are doing and how they are doing it is based on up-to-date knowledge and experience, several moves are needed.

First, we must put the research information and clinical findings we have to better use. One of the most productive things we could do to promote healthy personality development and to prevent mental ill health would be to provide, to a variety of people, a continuous flow of information based on an evaluation and interpretation of research by workers well grounded in mental health concepts.

This kind of knowledge would be of value to professional workers, including those in operating programs, and the faculties of schools of medicine, public health, nursing, and social work. Such professional workers may often find it impossible to keep up with the great stream of knowledge flowing from research relating to children.

Parents, citizens groups, and others who

years may rise by about 21 percent to a total of more than 67 million in 1965. This increase in child population will necessitate a continued expansion of the maternal and child health and crippled children's programs even if the only objective is the maintenance of the present rate of services.

The cost of providing health services continues to rise. The salaries of medical personnel in State health departments have increased 63 percent between 1947 and 1953. Salaries of public health nurses increased 74 percent. Hospital costs rose from an average of \$16.89 per patient-day in 1950 to \$22.78 in 1954, an increase of 35 percent. These are basic economic challenges which we must meet if our programs are to serve mothers and children even at present levels.

While infant mortality in the country as a whole has been reduced to a new record low of 27 per 1,000 infants born alive, infant losses in the perinatal period continue at a relatively high level. In 1954, for the United States as a whole, about 36 infants per 1,000 reported pregnancies were born dead or died in the neonatal period.

On the incidence and prevalence of maternal morbidity, we have few epidemiological facts to guide us. We do know, however, that more than 300,000 mothers a year in the United States are unable to carry their infants to term. This impairment in maternal health is associated with very high perinatal mortality in the infant.

We are following with much interest the reports on the effectiveness of the hormone Releasin in halting premature labor. If early results are confirmed, health departments will have a new agent to apply in the programs to reduce premature births and fetal and neonatal deaths.

Shift in Pediatric Work

With the American College of Obstetrics and Gynecology and the American Academy of Pediatrics, the Children's Bureau is sponsoring a project to develop more effective analysis of maternity and newborn infant hospital records with a view toward improving the care of mother and child in hospitals. This project is

planned as a 3-year study to be conducted in all hospitals in a cooperating community. The project will develop and demonstrate ways and means by which hospital staff can obtain maternity and newborn infant statistics useful not only to the individual hospital but also to the community as a whole in maintaining a high level of maternity and neonatal care. When the method is tested, we look forward to its use by many different kinds of hospitals, large and small, teaching and nonteaching, where the births in the United States take place.

Much progress has been made by the States in the past 20 years in the development of the crippled children's program with a major emphasis on orthopedies. Now, with the availability of specific therapeutic agents for many acute diseases, we are seeing a shift in emphasis in pediatric work. Throughout the country there is an increased interest among pediatricians in the care of children with chronic disease and handicapping conditions.

The long-range problem that I see ahead of us in the crippled children's program is to find the way to develop in each State adequate resources for the care of children who are handicapped and require long-term medical supervision and rehabilitative services. The number of children with handicaps other than orthopedic in nature are estimated to be nearly 10 times the number of orthopedically handicapped children. Yet they represent less than one-half of the children now receiving care under the crippled children's program. In developing clinics and other services for children with epilepsy, cleft palate, congenital heart disease, hearing impairment, limb amputations, and so forth, you have unusual opportunities for putting to work the knowledge that research is providing. Research makes it possible to treat or ameliorate much of childhood crippling, to rehabilitate children, and to prevent the progression of disability.

There are of course many more phases of your programs for children on which I could comment. I would like to make just one more point which has to do with the role State health departments play when the responsibility for health services or medical care for special groups of people rests in other State depart-

The report is specific with respect to the maximum cumulative exposure to the gonads that is safe according to present knowledge. It recommends the adoption of a national standard of maximum exposure to radiation that is consistent with safety. The report also emphasizes the importance of reexamining current practices in the use of X-ray or fluoroscopy in providing medical services. Some of these appear to expose infants and children and prospective parents more than is necessary or wise.

Partly as a result of your interest and that of the Association of Maternal and Child Health and Crippled Children's Directors, and because of a recommendation of the United States National Committee on Vital and Health Statistics, the Children's Bureau is establishing a National Committee to Reduce Hazards to Inheritance and Child Development. Its members will represent a number of scientific disciplines and relevant programs in the maternal and child health field. This committee will give national leadership to planning for research and other activities designed to reduce reproductive wastage and safeguard normal fetal development.

A related committee on radiological hazards is being planned concurrently with the overall committee. It will develop proposals to promote good radiological techniques, particularly as applied to children and pregnant women. The work of both of these committees will be reported as they get under way.

Child Health Programs

The Children's Bureau has welcomed the passage of the National Health Survey Act and looks forward to working closely with the Public Health Service in order to obtain the best information possible about the state of health of our child population. We know of your interest in the problem of congenital malformations and in children who have other types of crippling or handicapping conditions. We are looking forward to joint special studies to give us better information on the numbers and needs of these children than we have been able to obtain for many years.

The interest State health departments are showing in planning programs for mentally

retarded children portends a rapid and widespread development in this much neglected field. Congress, when it increased the maternal and child health grants from \$12 million to \$16 million, earmarked \$1 million for special projects for mentally retarded children and requested that an additional \$1 million be spent for this purpose. More than half the States are reported to be working on plans for programs for these children. Programs are already in operation in Arkansas, California, the District of Columbia, Hawaii, Idaho, and Washington; other requests are in the process of being approved. They are receiving fine support from parents and teachers as well as from the medical profession.

The rapidity with which the State crippled children's agencies expanded their programs last year when the grants were increased from \$11 million to \$15 million not only shows the need for services for children with chronic disease and handicapping conditions but testifies to your satisfactory administration of these programs. Otherwise such a rapid expansion would not have been possible.

A brief tabulation shows how these increased funds helped the crippled children's programs to grow last year. Thirty-nine States reported the increased funds were helping them to provide medical and hospital care for more children, and 19 States reported using the funds to help meet rising costs. The development of new and expanded programs, 20 of which were started in 16 States, includes the following:

| | States |
|-------------------------------|--------|
| Cleft palate..... | 9 |
| Congenital heart disease..... | 5 |
| Rheumatic fever..... | 8 |
| Hearing impairment..... | 15 |
| Epilepsy..... | 5 |
| Arm amputations..... | 2 |

The increasing child population and the mounting costs of these programs are in themselves basic problems. In 1955 the number of live births exceeded 4 million, a rate of 24.9 per 1,000 population and close to the highest in 30 years. The Nation's total child population under 18 years of age increased from 47 million in 1950 to 56 million in 1955, an 18 percent rise. The Bureau of the Census expects that between 1955 and 1965 the number of children under 18

The large deficit in mortality from diseases of the cardiovascular-renal system and from diabetes mellitus among Navajo Indians is too great to be accounted for by certain types of errors in death certification. Further epidemiological studies are required to explain why this tribe enjoys a more favorable experience with these diseases than white and other nonwhite Americans.

Cardiovascular-Renal and Diabetes Deaths Among the Navajos

By ROBERT LINCOLN SMITH, M.D., M.P.H.

IN A PREVIOUS paper Salsbury, Gilliam, and I showed that deaths certified as caused by cancer and by diseases of the circulatory and central nervous systems were substantially fewer among the Navajo Indians than would have been expected had observed white or non-white death rates prevailed (1). However, we pointed out that the apparent deficit of cancer alone could not be regarded as established beyond all reasonable doubt because of the large number of deaths in older Navajos for whom the cause of death was uncertain. Either the deceased had not been attended by the physician signing the death certificate or the cause of death had been assigned to senility. Nevertheless, the study clearly showed that the deficit in cancer and in cardiovascular-renal diseases,

taken all together, was too great to be accounted for by faulty death certification alone.

Other authors have also called attention to apparent deficits in these diseases among the Navajo Indians. Dealing with death certificate data, Hadley has noted that diseases of the heart, cancer, and vascular lesions affecting the central nervous system were not among the 6 leading causes of death for Navajos in 1950 (2).

Salsbury has observed that a diagnosis of some form of heart disease was made on only 0.4 percent of 4,826 admissions (mostly of Navajos) to the Sage Memorial Hospital at Ganado, Ariz., during the years 1931-35 (3).

Gilbert has reported that no clinically proved case of coronary thrombosis was found among 10,276 Navajos admitted to the Navajo Medical Center for the years from 1949 to 1952 (4).

In addition, Joslin (5, 6), Salsbury (7), and Cohen (8) have remarked on the infrequent recognition of diabetes among Navajo Indians.

Because of these observations, I have extended the analyses of the previous study on the Navajos (1) and have compared expected mortality with recorded mortality for the various specific causes that make up the broad cardiovascular-renal group of diseases. Since the data comprising this study approximate all of

Dr. Smith is an epidemiologist with the Biometry and Epidemiology Branch, National Cancer Institute, Public Health Service, Bethesda, Md. Formerly he was chief, bureau of tuberculosis control, Insular Department of Health, San Juan, P. R. (1948 to 1951), and medical consultant in chronic diseases, Public Health Service Region 3 and the Division of Chronic Disease and Tuberculosis, Public Health Service (1951 to 1954).

ments or agencies under either Federal or State laws or regulations.

As I see it, your minimum role is to make sure that preventive health services are included in all such programs and that the highest possible standards of care for the sick or disabled are set and adhered to. I am thinking of the new program of medical care for the dependents of men in the armed forces, especially the children among these dependents. I am thinking

of what you can do to work with the State departments of public welfare in raising standards of medical care provided for the aged and for dependent children under the new amendments to the Social Security Act that will become effective next July.

The benefits for our children to be derived from all of the programs I have mentioned represent a real investment in the future of our country, indeed, in the future of the world.

Dr. Eliot Leaves Children's Bureau



Dr. Martha M. Eliot has resigned as chief of the Children's Bureau, the office she held the last 5 of her 30 years of Government service. She returns to her native Massachusetts to head

the maternal and child health department of the Harvard School of Public Health.

In accepting Dr. Eliot's resignation, President Eisenhower noted her invaluable contributions to the "cause of better health and welfare of children, not only in our own Nation but around the world." In his letter he said, "I share with Secretary Folsom the hope that your new activities will be richly rewarding and that we may count upon your advice and help in the years to come."

Dr. Eliot was the first and only woman to be elected president of the American Public Health Association. For administrative achievement in organizing and operating a Government program that served a million and a half GI wives and infants in the Second

World War, Dr. Eliot was given the Lasker Award.

From 1919 to 1951, Dr. Eliot was Assistant Director-General of the World Health Organization. She was chairman of its Expert Committee on Maternal and Child Health in 1949, having served in 1948 as a member of the United States delegation to the First World Health Assembly in Geneva.

A graduate of Radcliffe with her doctorate from Johns Hopkins, Dr. Eliot began her long and distinguished career in maternal and child health services at the Peter Bent Brigham Hospital, Boston. She joined the Yale University Medical School in 1921 as instructor in the pediatric department from which she came to Washington as director of the Division of Maternal and Child Health in the Children's Bureau. There she directed one of the Bureau's first research programs, the prevention and control of rickets in children.

She served on the Board of Editors of *Public Health Reports* from its reorganization as a monthly periodical in 1952 until 1956.

The large deficit in mortality from diseases of the cardiovascular-renal system and from diabetes mellitus among Navajo Indians is too great to be accounted for by certain types of errors in death certification. Further epidemiological studies are required to explain why this tribe enjoys a more favorable experience with these diseases than white and other nonwhite Americans.

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the deaths occurring in a whole and fairly well defined population group, the results provide a better idea of forces of mortality among the Navajos than could be obtained from analyses of admissions to, or deaths in, any one hospital serving the tribe.

Method of Study and Results

The first article described how the Navajo deaths recorded by the Navajo Indian Agency were tabulated for the 5-year period 1948-52 (1). Because we were uncertain about the exact population base from which death certificate data were available, we estimated the Navajo population on the basis of the published 1950 census enumeration (61,371) of Indians resid-

ing in the area served by the Navajo Agency and on the basis of the total number (70,567) of Navajos estimated by the Navajo Agency for the same year, distributing the population by sex and age as in the census enumeration. These population estimates yielded a minimum and a maximum number of expected deaths, computed by multiplying the 1950 age-specific, sex-specific, and cause-specific death rates for the entire white United States population by the corresponding estimate in each of the two Navajo population groups. The results summed for all age groups and multiplied by 5 comprise the number of deaths from each cause that might be expected to occur among the Navajo Tribe in the 5 years centering around 1950 if all Navajos had been subjected

Figure 1. Recorded deaths among Navajo Indians, 1948-52, which were attributed to cardiovascular-renal diseases and diabetes mellitus, and deaths expected on the basis of 1950 age-specific, sex-specific, and cause-specific death rates for the white and nonwhite populations of the United States.

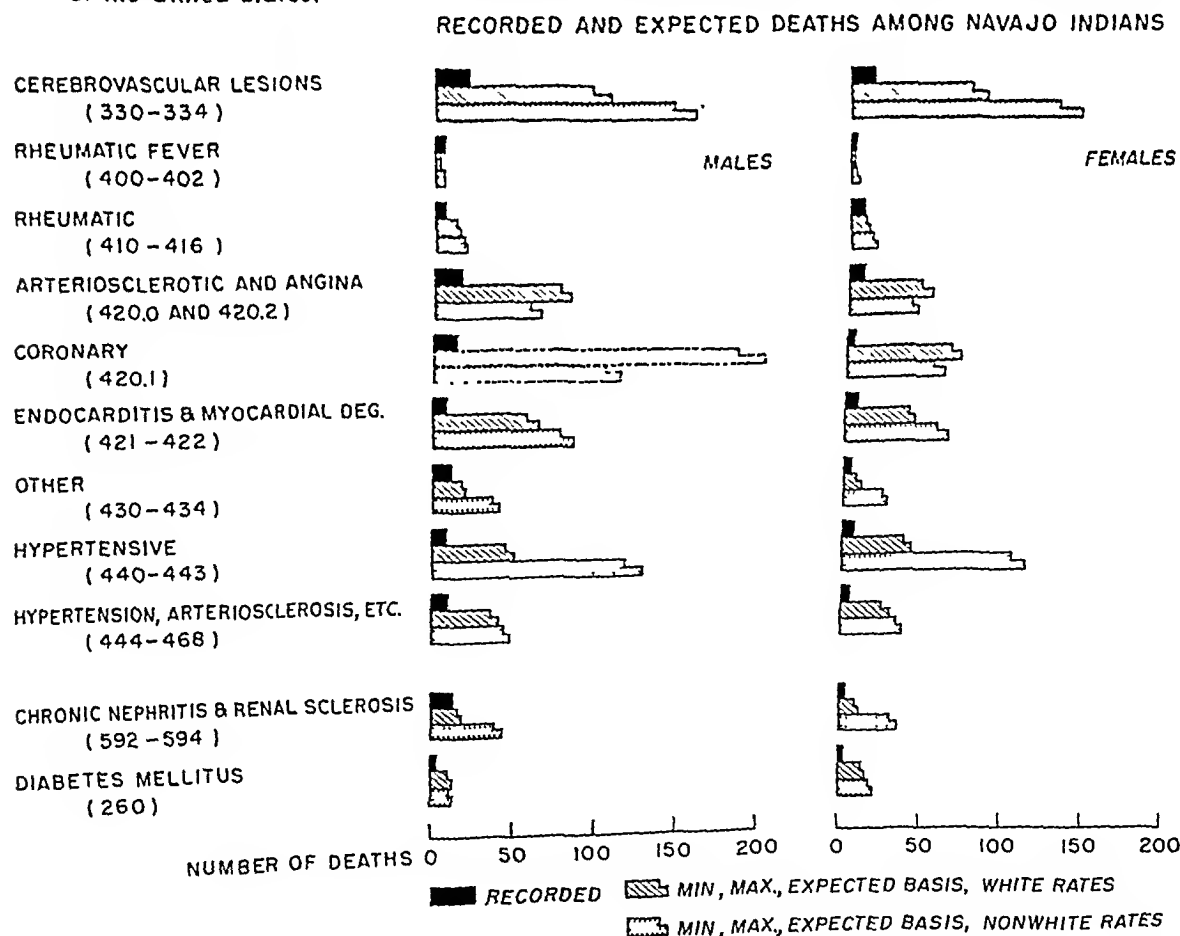


Table 1. Deaths among the Navajos attributed to cardiovascular-renal diseases and to diabetes mellitus during the 5-year period 1948-52 and deaths expected on the basis of age- and sex-specific rates observed in 1950 among the white and nonwhite United States populations

| Cause of death ¹ | Men | | | | | Women | | | | |
|--|---|--|--------------|-------------------|--------------|---|--|--------------|-------------------|--------------|
| | Num- ber of re- corded deaths | Expected ² deaths on basis of— | | | | Num- ber of re- corded deaths | Expected ² deaths on basis of— | | | |
| | | White rates | | Nonwhite rates | | | White rates | | Nonwhite rates | |
| | | Mini- mum | Max- imum | Mini- mum | Max- imum | | Mini- mum | Max- imum | Mini- mum | Max- imum |
| Major cardiovascular-renal diseases (330-334, 400-468, 592-594)----- | 105 | 534.5 | 587.0 | 629.7 | 691.5 | 73 | 324.1 | 356.0 | 494.2 | 542.0 |
| Vascular lesions affecting central nervous system (330-334)----- | ³ 19 | 93.9 | 103.1 | 141.6 | 155.5 | ⁵ 15 | 75.2 | 82.6 | 129.2 | 141.9 |
| Diseases of the circulatory system (400-468)----- | 73 | 425.0 | 466.7 | 448.6 | 492.6 | 54 | 238.0 | 261.4 | 332.7 | 365.3 |
| Rheumatic fever (400-402)----- | ⁵ 5 | 1.8 | 2.0 | 3.8 | 4.2 | ⁶ 3 | 2.0 | 2.2 | 4.3 | 4.7 |
| Diseases of the heart (410-443)--- | 59 | 388.2 | 426.2 | 402.8 | 442.3 | 46 | 211.0 | 231.7 | 294.4 | 323.3 |
| Chronic rheumatic heart disease (410-416)----- | 5 | 13.1 | 14.4 | 16.2 | 17.7 | ⁶ 10 | 11.2 | 12.2 | 14.3 | 15.7 |
| Arteriosclerotic heart disease including coronary disease (420)----- | 29 | 257.6 | 282.9 | 159.2 | 174.9 | 15 | 111.1 | 122.0 | 94.9 | 104.2 |
| Arteriosclerotic heart disease, so described (420.0)----- | ⁷ 14 | 72.8 | 79.9 | 55.4 | 60.8 | ⁸ 10 | 45.4 | 49.9 | 37.7 | 41.4 |
| Heart disease specified as involving coronary arteries (420.1)----- | ⁸ 13 | 183.0 | 200.9 | 101.8 | 111.8 | ⁶ 5 | 65.0 | 71.3 | 55.9 | 61.4 |
| Angina pectoris (420.2)----- | ⁵ 2 | 1.8 | 2.0 | 2.0 | 2.3 | 0 | .7 | .8 | 1.2 | 1.3 |
| Nonrheumatic chronic endo- carditis and other myo- cardial degeneration (421- 422)----- | 7 | 57.1 | 62.7 | 76.2 | 83.7 | 8 | 40.7 | 44.7 | 57.1 | 62.7 |
| Chronic endocarditis not spec- ified as rheumatic (421)--- | 1 | 6.4 | 7.1 | 14.4 | 15.8 | 1 | 4.2 | 4.6 | 10.0 | 11.0 |
| Other myocardial degenera- tion (422)----- | ⁶ 6 | 50.7 | 55.6 | 61.8 | 67.9 | 7 | 36.5 | 40.1 | 47.1 | 51.7 |
| Other diseases of the heart (430-434)----- | ³ 10 | 16.8 | 18.5 | 35.7 | 39.2 | ⁶ 6 | 8.7 | 9.6 | 24.7 | 27.1 |
| Hypertension with heart dis- ease (440-443)----- | 8 | 43.6 | 47.7 | 115.5 | 126.8 | 7 | 39.3 | 43.2 | 103.4 | 113.6 |
| Hypertensive heart disease with arteriolar nephroscle- rosis (442)----- | 4 | 15.0 | 16.4 | 37.2 | 40.8 | ⁴ 6 | 11.1 | 12.2 | 28.3 | 31.1 |
| Essential hypertension with heart disease, etc. (440, 441, 443)----- | ⁶ 4 | 28.6 | 31.3 | 78.3 | 86.0 | 1 | 28.2 | 31.0 | 75.1 | 82.5 |
| Hypertension without mention of heart (444-447)----- | 3 | 7.4 | 8.1 | 17.0 | 18.7 | 0 | 5.6 | 6.1 | 14.9 | 16.5 |
| Hypertension with arteriolar nephrosclerosis (446)----- | 3 | 4.0 | 4.4 | 7.8 | 8.6 | 0 | 2.5 | 2.7 | 5.5 | 6.1 |
| Essential hypertension and other hypertensive disease (444, 445, 447)----- | 0 | 3.4 | 3.7 | 9.2 | 10.1 | 0 | 3.1 | 3.4 | 9.4 | 10.4 |
| General arteriosclerosis (450)--- | 3 | 22.4 | 24.6 | 19.8 | 21.7 | 3 | 16.2 | 17.8 | 13.8 | 15.1 |
| Other diseases of circulatory sys- tem (451-468)----- | 3 | 5.2 | 5.8 | 5.2 | 5.7 | 2 | 3.2 | 3.6 | 5.3 | 5.7 |
| Chronic and unspecified nephritis and other renal sclerosis (592-594) | ⁴ 13 | 15.6 | 17.2 | 39.5 | 43.4 | 4 | 10.9 | 12.0 | 32.3 | 35.4 |
| Diabetes mellitus (260)----- | 3 | 11.7 | 13.0 | 11.6 | 12.8 | 3 | 14.2 | 15.6 | 18.9 | 20.7 |

¹ Numbers in parentheses represent diseases listed in the International Statistical Classification of Diseases, Injuries, and Causes of Death, 6th revision.

² The minimum and maximum numbers of deaths expected are dependent on different estimates of the number and age composition of the Navajo population at risk.

³ In 2 cases death certificate signed by physician not in attendance.

⁴ In 1 case death certificate not signed by a physician.

⁵ In 2 cases death certificate not signed by a physician.

⁶ In 1 case death certificate signed by physician not in attendance.

⁷ In 4 cases death certificate signed by physician not in attendance.

⁸ In 3 cases death certificate signed by physician not in attendance.

to the same age-specific and sex-specific rates prevailing in the population of the United States as a whole.

The results of these computations are shown in figure 1 and table 1. Numbers in parentheses refer to diseases listed in the International Statistical Classification of Diseases, Injuries, and Causes of Death, sixth revision.

Only 105 male deaths during the 5-year period were charged to the major cardiovascular-renal diseases although from 531 to 692 deaths would have been expected on the basis of rates prevailing among the white and non-white United States populations (table 1). Deaths recorded from these causes were, therefore, only 15 to 20 percent of the deaths expected. Similar results are noted among women. Seventy-three deaths were recorded as compared with an expectation of 321 and 513 deaths. The standardized mortality ratios thus computed for women vary between 13 and 23.

Further examination of table 1 shows that this very large total deficit is contributed to by all of the individual causes of death except rheumatic fever. Rheumatic fever, however, accounted for only a small number and proportion of deaths. Five deaths were recorded for men and three for women. Note also that the differences between recorded and expected deaths are not great for chronic rheumatic heart disease, especially among Navajo women. When comparisons are made on the basis of rates prevailing among the white population, little difference is noted between expected and observed deaths for chronic and unspecified nephritis and other renal sclerosis (592-594), for hypertension with arteriolar nephrosclerosis without mention of heart (446), and for the category that includes acute and subacute endocarditis, acute myocarditis, acute pericarditis, and functional and other unspecified heart diseases (430-434). For these same diseases, however, substantial differences are noted in comparison with nonwhite experience.

Among the causes of death tabulated, the greatest deficit is observed for coronary disease (420.1), for which the mortality recorded is only 6 to 13 percent of that expected in men and only 7 to 9 percent of that expected in women. This deficit is equally as outstanding in the age

group 45 to 64 as it is in the group 65 years of age and older.

Diabetes mellitus (260) was the assigned cause of death for 3 men and 3 women, but the number of expected deaths varied from 12 to 13 for men and from 14 to 21 for women.

Discussion and Conclusion

In the foregoing I have shown that deaths attributed to cardiovascular-renal diseases among the Navajo Tribe are substantially less than would be expected had United States white or nonwhite death rates prevailed. With the exception of rheumatic fever, all of the major causes of death that were considered have contributed to this deficit. In evaluating the deficit, however, consideration must be taken of three facts to which the first study called attention (1).

The first is that deaths other than violent deaths among Navajos in the ages of highest cancer risk (45 years of age and older) which were unattended by a physician or which were assigned to senility and to other ill-defined

Table 2. Deaths attributed to cardiovascular-renal diseases,¹ difference between recorded and expected deaths

| Age (years) | Re- corded deaths | Expected deaths | | Difference | | |
|------------------|-------------------------|--------------------|--------------|--------------|--------------|--|
| | | Mini- mum | Maxi- mum | Mini- mum | Maxi- mum | |
| | | Men | | | | |
| Under 45----- | 37 | 31. 8 | 75. 4 | +5 | -38 | |
| 45-64----- | 18 | 140. 7 | 246. 4 | -123 | -228 | |
| 65 and over----- | 50 | 362. 0 | 369. 7 | -312 | -320 | |
| Total---- | 105 | 534. 5 | 691. 5 | -430 | -586 | |
| | | Women | | | | |
| Under 45----- | 29 | 20. 1 | 83. 6 | +9 | -55 | |
| 45-64----- | 15 | 51. 9 | 178. 7 | -37 | -164 | |
| 65 and over----- | 29 | 252. 1 | 280. 3 | -223 | -251 | |
| Total---- | 73 | 324. 1 | 542. 6 | -251 | -470 | |

¹ Numbered 330-334, 400-468, 592-594 in the International Statistical Classification of Diseases, Injuries, and Causes of Death, 6th revision.

Table 3. Deaths (except violent deaths) which were either unattended by the physician signing death certificate or attributed to senility or other ill-defined cause

| Age | Men | Women |
|------------------|-----|-------|
| Under 45..... | 244 | 269 |
| 45-64..... | 50 | 35 |
| 65 and over..... | 76 | 51 |
| Total..... | 370 | 358 |

causes were more than enough to account numerically for the recorded deficit of cancer. When this point is examined for cardiovascular-renal diseases, however, the deficit is too large to be accounted for in this way. Because of the greater uncertainty of correct diagnosis in the very old, we compared the deficit of mortality in the cardiovascular-renal diseases with the number of unreliably certified deaths among Navajos in the age groups 45 to 64 and 65 and older. The deficit in recorded mortality attributed to cardiovascular-renal diseases is shown in table 2, and the deaths assigned to senility or ill-defined causes and unattended deaths are shown in table 3.

Comparison of tables 2 and 3 clearly shows a much larger deficit of recorded cardiovascular-renal diseases in Navajos 65 years of age and older than could be accounted for even if all of the unreliably certified deaths were due to these causes. This is also true for Navajos 45 to 64 years of age, though to a lesser extent. For deaths occurring among members of the tribe under 45 years of age, the calculated deficit of cardiovascular-renal diseases for both men and women is much less than the unreliably certified deaths. There are, in fact, a few more deaths recorded from these causes than would be expected on the basis of the minimum estimate. However, it is reasonable to assume that most of the unreliably certified deaths in Navajos under 45 are properly assignable to causes other than cardiovascular-renal, especially since 200 of the 244 deaths in males and 209 of the 269 deaths in females occurred in individuals under 25 years of age.

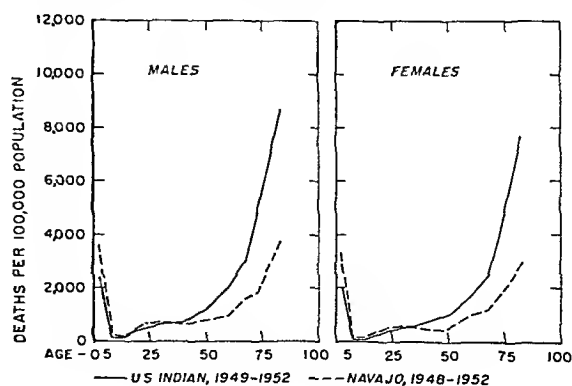
Second, there was a question whether some of the excess Navajo mortality certified as caused by respiratory and digestive diseases might ac-

tuallly be due to cancer or cardiovascular-renal diseases. That this is unlikely is indicated by the fact that the excess mortality in these diseases is almost entirely limited to Navajo children less than 5 years old. This is also true, though to a lesser degree, for the excess mortality attributed to respiratory tuberculosis. Excess mortality for respiratory tuberculosis occurred principally in Navajos under 45 years of age. For those 45 years and over mortality from respiratory tuberculosis was only moderate.

A third consideration is the fact that age-specific death rates for all causes in older ages are lower among the Navajo Indians than among all Indians. The difference between these rates becomes progressively greater with age as is seen in figure 2. While this fact is suggestive of under-reporting of Navajo deaths in the older age groups, it is also consistent with the idea that the Navajo Tribe is subject to different forces of mortality from those operating for Indians as a whole. In any event, under-reporting must be considered as a potential factor contributing to the observed deficit in mortality attributed to cardiovascular-renal disease.

To test the possible effect of under-reporting, deaths for all causes recorded among the Navajos were compared with deaths expected had the tribe experienced the overall mortality of all American Indians. Though the results of these calculations are not illustrated, they did show fewer deaths from all causes among

Figure 2. Average annual age-specific and sex-specific death rates for all causes among all American Indians, 1949-52, and among the Navajo Indians, 1948-52.



older Navajo Indians, such as might have been anticipated from the rates shown in figure 2. It seems highly unlikely that all postulated under-recording of deaths could be attributed to cardiovascular-renal diseases alone. Even if it were, however, under-recording at its maximum was hardly sufficient to account for the deficit of cardiovascular-renal mortality shown in table 2. The evidence therefore favors the view that the Navajo Tribe experienced a real deficit of cardiovascular-renal disease. The true magnitude of this deficit cannot be assessed accurately from these data.

Analysis of mortality recorded among Navajo Indians supports the view that cardiovascular-renal diseases are less commonly encountered among this tribe of American Indians than in the general white and nonwhite populations of the United States.

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Geographic Variation in Leukemia Mortality in the United States

By BRIAN MacMAHON, M.D.

DIFFERENCES BETWEEN countries in the recorded death rate from leukemia are considerable. Notable differences are evident even when countries with reasonably complete death registration are compared. For example, the United States, Denmark, and Sweden experience death rates from leukemia $1\frac{1}{2}$ times as high as those of Canada, Great Britain, and France, which again have much higher rates than Ireland, Italy, or Finland (1).

Geographic variation within countries has also been noted. Hewitt (2), examining death registration data for England and Wales, noted a fairly regular gradient from a relatively low level in the north to a level about half as high again in the south. Material from the Danish Cancer Registry (3) showed highest rates in the capital and lowest in the rural areas. Otherwise, there were no definite topographical differences in Denmark. Higher rates for the urban compared with the rural population have been noted also in the United States (4). Death registration data for leukemia in the United States have been examined on a number of occasions (5-8), but no study of geographic variation between regions or States within the United States has been reported.

The National Office of Vital Statistics of the

Public Health Service has published annually data on deaths from leukemia in the United States, classified according to State of residence, sex, race, and age, since 1949 (9). Prior to 1949 the reports did not include a breakdown by age for deaths from this cause in the individual States. The present study is based in the main, therefore, on data for the 5 years 1949-53. Attention is confined to the white population. Age-standardized death rates are shown in table 1 for the male, female, and total populations of each State and each division. The standard population used was the total white population of the United States in 1950; nine age groups were used in the standardizations.

In addition to the standardized rates, comparative mortality indexes for the individual States are given in table 1. These indexes express the observed number of deaths in each area as a percentage of the number of deaths expected in the area on the basis of (a) the age and sex distribution of the population of the area, and (b) the age-specific and sex-specific death rates from leukemia observed in the total United States white population.

Differences Between Divisions

The nine divisions into which the States are grouped are those used by the Bureau of the Census. Differences between them in leukemia death rate were not great. The highest division, Pacific, with a mean annual death rate of 69.9 per million, was 20 percent higher than the lowest, East South Central, with a rate of 58.4.

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Table 1. Leukemia death rates and characteristics for the white population of States and divisions of the United States, 1949-53 and 1938-42

| Division and State | Number of leukemia deaths, 1949-53 | | | Standardized death rate per million, 1949-53 | | | Corrected sex ratio 1949-53 (percent male) | Comparative mortality index 1949-53 | Comparative mortality index 1938-42 | Percentage increase from 1938-42 to 1949-53 | Mean yearly increment in leukemia death rate ¹ | | Physicians per 100,000 population, 1949 |
|----------------------|------------------------------------|--------|-------|--|--------|-------|--|-------------------------------------|-------------------------------------|---|---|---------|---|
| | Male | Female | Total | Male | Female | Total | | | | | 1938-45 | 1946-53 | |
| New England | 1,687 | 1,331 | 3,018 | 71.8 | 52.7 | 62.2 | 57.7 | 97 | 67 | 45 | 1.8 | 2.0 | 151 |
| Maine | 136 | 108 | 244 | 56.5 | 43.5 | 50.0 | 56.5 | 78 | 55 | 42 | 1.5 | 2.2 | 97 |
| New Hampshire | 97 | 81 | 181 | 67.2 | 51.2 | 60.7 | 55.4 | 95 | 47 | 102 | 2.6 | 1.8 | 126 |
| Vermont | 80 | 69 | 149 | 50.3 | 67.1 | 58.8 | 51.4 | 114 | 57 | 100 | 1.5 | 2.6 | 170 |
| Massachusetts | 881 | 683 | 1,564 | 75.0 | 52.6 | 63.7 | 58.8 | 99 | 73 | 36 | 1.5 | 2.6 | 118 |
| Rhode Island | 111 | 87 | 198 | 58.9 | 42.5 | 50.7 | 58.1 | 78 | 59 | 32 | 1.8 | 1.6 | 152 |
| Connecticut | 382 | 300 | 682 | 77.6 | 58.2 | 67.9 | 57.1 | 105 | 69 | 52 | 2.8 | 1.5 | 161 |
| Middle Atlantic | 5,400 | 4,171 | 9,571 | 75.9 | 56.5 | 66.2 | 57.3 | 103 | 75 | 37 | 1.4 | 2.5 | 196 |
| New York | 2,908 | 2,177 | 5,085 | 82.4 | 59.0 | 70.6 | 58.3 | 110 | 83 | 33 | 1.7 | 2.4 | 128 |
| New Jersey | 862 | 615 | 1,507 | 77.0 | 55.3 | 66.1 | 58.2 | 103 | 72 | 43 | 1.6 | 2.6 | 118 |
| Pennsylvania | 1,630 | 1,310 | 2,979 | 66.2 | 53.5 | 59.8 | 55.3 | 93 | 65 | 41 | 2.0 | 2.5 | 118 |
| East North Central | 5,516 | 3,875 | 9,391 | 75.1 | 53.2 | 64.1 | 58.5 | 100 | 68 | 47 | 2.0 | 2.5 | 118 |
| Ohio | 1,473 | 1,077 | 2,550 | 76.7 | 53.5 | 65.0 | 58.1 | 103 | 63 | 63 | 1.6 | 3.8 | 116 |
| Indiana | 691 | 478 | 1,169 | 71.1 | 49.2 | 60.1 | 50.1 | 93 | 58 | 60 | 2.0 | 1.2 | 103 |
| Illinois | 1,551 | 1,122 | 2,673 | 74.1 | 51.4 | 62.5 | 58.1 | 99 | 76 | 30 | 1.5 | 1.7 | 141 |
| Michigan | 1,096 | 708 | 1,801 | 75.0 | 50.3 | 62.6 | 59.9 | 97 | 66 | 47 | 1.4 | 2.7 | 106 |
| Wisconsin | 705 | 400 | 1,105 | 78.2 | 56.7 | 67.4 | 58.0 | 105 | 75 | 40 | 2.5 | 3.2 | 101 |
| West North Central | 2,948 | 2,056 | 5,004 | 79.7 | 58.8 | 69.2 | 57.8 | 107 | 71 | 51 | 2.0 | 3.5 | 113 |
| Minnesota | 749 | 481 | 1,230 | 91.3 | 61.2 | 77.2 | 59.5 | 121 | 90 | 38 | 1.5 | 3.7 | 132 |
| Iowa | 572 | 391 | 965 | 78.6 | 55.6 | 67.1 | 58.6 | 105 | 67 | 37 | 1.0 | 3.7 | 105 |
| Missouri | 711 | 510 | 1,221 | 71.4 | 50.3 | 60.8 | 58.7 | 95 | 61 | 56 | 1.9 | 2.7 | 120 |
| North Dakota | 101 | 85 | 186 | 63.7 | 63.1 | 63.4 | 50.2 | 97 | 74 | 31 | 2.7 | 1.9 | 75 |
| South Dakota | 141 | 82 | 223 | 83.5 | 55.7 | 69.5 | 60.0 | 108 | 69 | 57 | 1.6 | 2.4 | 73 |
| Nebraska | 287 | 193 | 480 | 79.6 | 55.7 | 67.6 | 58.8 | 106 | 70 | 51 | 1.0 | 3.9 | 113 |
| Kansas | 387 | 312 | 699 | 77.5 | 63.7 | 70.6 | 51.9 | 110 | 67 | 61 | 1.1 | 4.0 | 103 |
| South Atlantic | 2,444 | 1,801 | 4,245 | 67.5 | 50.3 | 58.9 | 57.3 | 91 | 56 | 63 | 1.9 | 2.1 | 96 |
| Delaware | 56 | 35 | 91 | 83.2 | 49.7 | 66.4 | 62.6 | 103 | 66 | 56 | 1.7 | 2.1 | 126 |
| Maryland | 290 | 238 | 528 | 64.9 | 49.7 | 57.2 | 56.6 | 89 | 62 | 44 | 1.7 | 2.3 | 136 |
| District of Columbia | 99 | 73 | 172 | 81.0 | 52.2 | 66.9 | 61.7 | 101 | 95 | 9 | 1.3 | 1.1 | 267 |
| Virginia | 356 | 283 | 639 | 62.0 | 48.6 | 55.2 | 56.1 | 87 | 55 | 58 | 2.6 | 1.5 | 91 |
| West Virginia | 307 | 195 | 502 | 69.3 | 46.1 | 57.6 | 60.1 | 90 | 49 | 84 | 1.9 | 2.5 | 84 |
| North Carolina | 382 | 317 | 699 | 61.0 | 49.8 | 55.4 | 55.1 | 89 | 51 | 65 | 1.9 | 1.8 | 79 |
| South Carolina | 175 | 136 | 311 | 70.1 | 49.6 | 59.8 | 58.6 | 89 | 45 | 98 | 2.1 | 1.5 | 69 |
| Georgia | 373 | 268 | 641 | 72.2 | 50.4 | 61.2 | 58.9 | 95 | 58 | 61 | 1.5 | 2.2 | 84 |
| Florida | 406 | 259 | 665 | 71.7 | 46.1 | 58.8 | 60.9 | 92 | 51 | 80 | 1.8 | 3.9 | 91 |
| East South Central | 1,372 | 1,003 | 2,375 | 67.9 | 49.1 | 58.4 | 58.0 | 93 | 48 | 94 | 1.7 | 2.7 | 79 |
| Kentucky | 418 | 307 | 725 | 63.1 | 47.3 | 55.2 | 57.1 | 86 | 43 | 100 | 2.1 | 3.0 | 84 |
| Tennessee | 425 | 343 | 768 | 68.4 | 53.0 | 60.6 | 56.3 | 102 | 52 | 96 | 1.6 | 3.0 | 90 |
| Alabama | 332 | 227 | 559 | 72.0 | 47.7 | 59.7 | 60.2 | 92 | 43 | 114 | 1.9 | 2.8 | 68 |
| Mississippi | 197 | 126 | 323 | 71.6 | 45.9 | 58.7 | 60.9 | 91 | 56 | 63 | 1.8 | 1.3 | 64 |
| West South Central | 2,053 | 1,431 | 3,484 | 73.5 | 51.1 | 62.2 | 59.0 | 97 | 53 | 83 | 1.7 | 3.3 | 95 |
| Arkansas | 240 | 161 | 401 | 65.7 | 46.4 | 56.0 | 58.6 | 87 | 40 | 118 | 2.8 | 3.7 | 82 |
| Louisiana | 316 | 209 | 525 | 81.2 | 50.6 | 65.8 | 61.6 | 102 | 55 | 85 | 1.6 | 3.3 | 104 |
| Oklahoma | 376 | 267 | 643 | 73.6 | 53.3 | 63.4 | 58.0 | 98 | 44 | 123 | 2.4 | 4.8 | 94 |
| Texas | 1,121 | 797 | 1,918 | 74.3 | 52.2 | 63.2 | 58.7 | 98 | 59 | 66 | 1.0 | 2.8 | 95 |
| Mountain | 850 | 609 | 1,459 | 72.4 | 55.8 | 64.1 | 55.9 | 100 | 56 | 79 | 1.9 | 3.9 | 110 |
| Montana | 130 | 85 | 215 | 81.8 | 64.6 | 73.2 | 55.9 | 113 | 67 | 69 | 1.6 | 5.5 | 94 |
| Idaho | 127 | 77 | 204 | 85.7 | 59.5 | 72.5 | 59.0 | 114 | 50 | 128 | 1.8 | 8.1 | 77 |
| Wyoming | 36 | 27 | 63 | 51.8 | 48.7 | 50.3 | 51.5 | 75 | 53 | 42 | 1.3 | 3.4 | 83 |
| Colorado | 229 | 187 | 416 | 69.3 | 57.6 | 63.4 | 54.6 | 99 | 59 | 68 | 1.6 | 0.7 | 73 |
| New Mexico | 79 | 60 | 139 | 56.7 | 49.1 | 52.9 | 53.6 | 85 | 46 | 85 | 1.6 | 0.7 | 97 |
| Arizona | 102 | 78 | 180 | 69.0 | 53.1 | 61.0 | 56.5 | 96 | 51 | 88 | 2.2 | 4.7 | 115 |
| Utah | 117 | 77 | 194 | 80.1 | 50.7 | 65.3 | 61.2 | 102 | 55 | 85 | 2.4 | 4.5 | 110 |
| Nevada | 30 | 18 | 48 | 75.0 | 57.2 | 66.1 | 56.7 | 103 | 52 | 98 | 2.6 | 2.3 | 132 |
| Pacific | 2,802 | 2,077 | 4,879 | 80.5 | 59.3 | 69.9 | 57.6 | 107 | 75 | 43 | 3.4 | 2.0 | 106 |
| Washington | 477 | 312 | 789 | 77.3 | 54.7 | 65.9 | 58.6 | 97 | 70 | 39 | 3.6 | 4.3 | 109 |
| Oregon | 337 | 195 | 532 | 84.4 | 52.7 | 68.5 | 61.6 | 107 | 71 | 51 | 1.6 | 2.0 | 142 |
| California | 1,988 | 1,570 | 3,558 | 81.0 | 61.3 | 71.0 | 56.9 | 110 | 77 | 43 | 1.6 | 2.0 | 142 |

¹ Values are not calculated for States with less than 500,000 white population in 1950.

All three southern divisions (East South Central, West South Central, and South Atlantic) had rates lower than any other area. By contrast, rates were highest in the west. The Pacific, Mountain, and West North Central divisions ranked first, second, and fourth in order of leukemia death rates.

Since Meadors (4) found the leukemia death rate approximately $1\frac{1}{2}$ times higher in the urban than in the rural population of the United States, some relationship between leukemia death rate and degree of urbanization of the area might be expected. The lower leukemia death rate in the three southern divisions is consistent with this expectation. However, among the other six divisions, the death rates showed little relationship to the pattern of urbanization. The two divisions with the highest leukemia rates, Pacific and West North Central, were third and seventh in a listing according to urbanization. The two most urban divisions, Middle Atlantic and New England, ranked third and sixth according to leukemia death rates. Meadors' finding was based on a direct comparison of the urban and rural populations and is therefore in no way invalidated by the finding of high leukemia rates in areas with low urbanization, or vice versa. It seems likely, however, that the urban-rural difference in leukemia death rates was operating during the period of the present study to reduce some of the geographic differences between divisions.

Adjustment of the divisional death rates is possible on the basis of the known percentage of the population of the division classified as urban, and the assumption that the rates for the urban population were $1\frac{1}{2}$ times higher than those for the rural population in each division. This assumption was made on the basis of Meadors' findings for the whole United States. After adjustment on this basis, divisional death rates were West North Central 72.7, Pacific 66.8, Mountain 66.3, East South Central 64.9, West South Central 64.3, East North Central 63.1, South Atlantic 62.6, Middle Atlantic 61.9, and New England 59.1. The adjustment has raised the rates for the southern divisions relative to divisions in the northeast, suggesting that the originally low rates in the south may result from

the lower percentage of urban population there. However, the adjustment has accentuated the difference between the west and the northeast. The three western divisions now rank first, second, and third in order of leukemia death rates.

Differences Between States

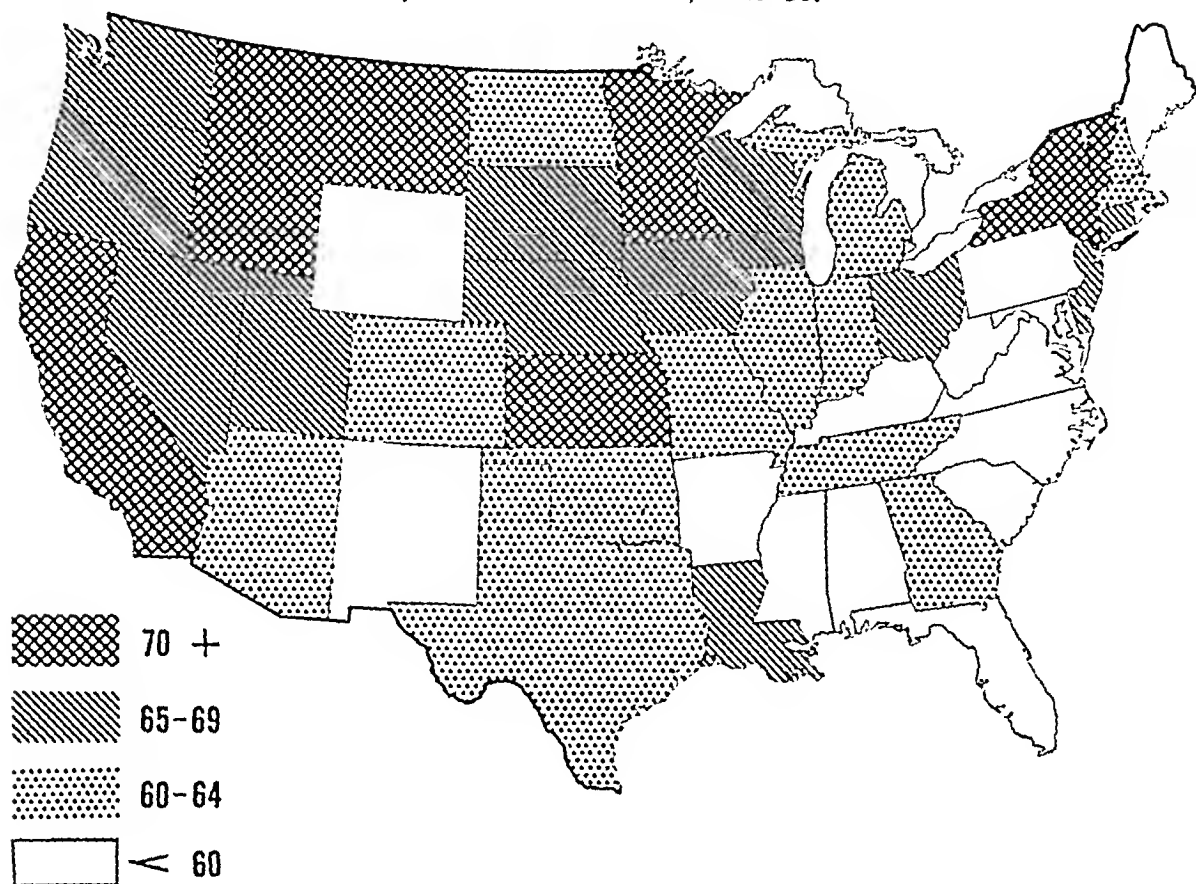
The individual States showed greater variation in leukemia death rates than the divisions (table 1, fig. 1). States with the highest rates in 1949-53 were Minnesota (79.2), Vermont (73.8), Montana (73.2), Idaho (72.5), California (71.0), New York (70.6), and Kansas (70.6). Lowest rates were in Maine (50.0), Wyoming (50.3), Rhode Island (50.7), and New Mexico (52.9).

Greatest variation in leukemia death rates was between States constituting the New England and Mountain divisions. New England included the second highest State (Vermont) as well as the 46th and 48th (Rhode Island and Maine). In the Mountain division there was disparity between the four northwestern States with the rates of 73.2, 72.5, 65.3, and 66.1, and the four southeastern States with rates of 63.4, 61.0, 52.9, and 50.3. The three Middle Atlantic States showed less variation, from 70.6 in New York to 59.8 in Pennsylvania.

On the other hand, the States constituting the three southern divisions showed fair uniformity in their low individual rates. Of the 17 States (including the District of Columbia) in these divisions, only the District of Columbia, Delaware, and Louisiana, with rates of 67.9, 66.4, and 65.4, respectively, had rates higher than the overall rate for the country (64.4). Similarly, the States of the Pacific and the West North Central divisions showed almost uniformly high rates. Of the 10 States in these divisions, only North Dakota and Missouri, had rates lower than the national average.

Once again it might be expected that some of these geographic variations could be attributed to differences between States in variables which are known to affect leukemia death rates, such as urban dwelling (3, 4) and income (5, 10, 11). Coefficients have been calculated for the correlation of the comparative mortality index in each State with the percentage of the white pop-

Figure 1. Mean annual age- and sex-standardized leukemia deaths per 100,000 white persons for each State, 1949-53.



nation of the State classified as urban in 1950, the median income of the white population in 1949, and the number of active non-Federal physicians per 100,000 population in 1949. The correlation with the percentage of urban population was small and insignificant ($r=0.13 \pm 0.14$), but higher correlations were found with both median income ($r=0.27 \pm 0.14$) and density of physicians ($r=0.35 \pm 0.14$). Partial correlation suggested closer association of the leukemia death rate with density of physicians when income was kept constant ($r=0.24$) than with income with physician density constant ($r=0.06$).

The interpretation of these associations is discussed below. It is clear however that they account for only a part of the geographic variation. In sharp contrast to this trend are, for example, the high leukemia rates noted in certain Mountain and other western States in spite of low physician:population ratios, and the

relatively low leukemia rates found in the industrial middle west.

Variations by Age and Sex

The general pattern of the distribution of death rates among States was similar for males and females. The coefficient of correlation between the rates for males and females in the same States was 0.55 ± 0.14 . There is a suggestion that the sex ratio tended to be high in those States with high total death rates ($r=0.26 \pm 0.14$). However, the correlation coefficient is not significant. In general, sex ratios were constant at about 58 percent male from division to division, and, even between States, differences were small (table 1). In the few States in which the proportion of males affected was higher than average, the age trend was not such as to suggest any specific occupational risk.

Numbers are too small for reliable examina-

tion of age trends in the individual States, but divisional age-specific rates are examined in table 2. The rate for each age group for each division is shown as a percentage of the rate for the United States in the same age group. The rates in the Pacific division were particularly high (compared with total United States rates) in the age groups 0-14 and to a lesser extent in the older age groups. In the West North Central division, on the other hand, rates were relatively highest in the older age groups. Two divisions, Middle Atlantic and East South Central, were characterized by relatively high rates in the age groups 15-44.

The different pathological varieties of leukemia have different age and sex trends (12). It may be, therefore, that these age differences in rates for divisions are indicative of variations in the proportions of the different types of leukemia. On the other hand, local circumstances may affect the shape of the age trend through changes in the age-specific risks for a specific pathological diagnosis. No data permitting examination of this question are available.

Secular Changes

To determine whether these geographic patterns have undergone any recent changes, data have been assembled for the 5 years surrounding the census of 1940 (1938-42). As mentioned previously, data on leukemia deaths in individual States are not available by age for this period, and age-standardized death rates can-

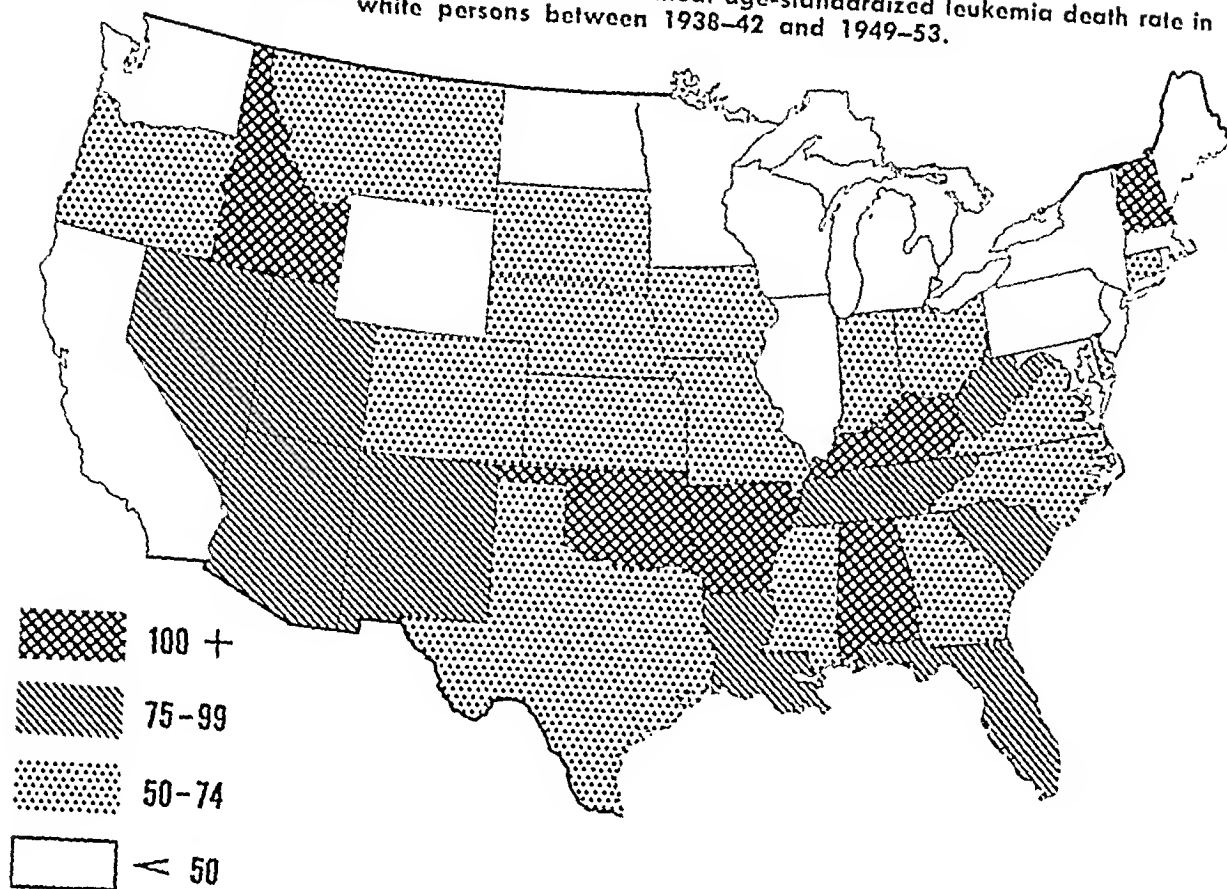
not be calculated. The measurement of secular change in mortality in individual States has therefore been approached in two ways. First, comparative mortality indexes have been calculated for each State for 1938-42, using the total age-specific and sex-specific rates of 1949-53 for the calculation of expected numbers. The increase in the index between 1938-42 and 1949-53 is then expressed as a percentage of the 1938-42 index in the same State (table 1). Second, regression lines have been fitted to the annual crude leukemia death rates in each State separately for the two periods 1938-45 and 1946-53. From these, the regression coefficient is shown as the mean annual increment in table 1. This second method does not allow for age changes in population but gives a crude measure of the rate of increase of leukemia mortality in the two halves of the time period.

In examining the comparative mortality indexes for 1938-42, we may note that the overall pattern is similar to that of the later period, 1949-53. However, there is a suggestion that the physician-income-urbanization complex was more influential in determining leukemia death rates in the early period. Coefficients of correlation of the comparative mortality indexes for 1938-42 with density of physicians and percentage of urban population in 1940 were 0.62 ± 0.14 and 0.60 ± 0.14 , respectively. Data on median income of the white population were not published by State for the 1940 census. The stronger association with the urbanization com-

Table 2. Age-specific leukemia death rates in each division, as a percentage of the United States rate for the same age group, 1949-53

| Age | Pacific | West North Central | Middle Atlantic | East North Central | Mountain | New England | West South Central | South Atlantic | East South Central | Death rate per million, United States |
|-------|---------|--------------------|-----------------|--------------------|----------|-------------|--------------------|----------------|--------------------|---------------------------------------|
| 0-4 | 114 | 101 | 95 | 106 | 97 | 99 | 102 | 89 | 89 | 58.7 |
| 5-14 | 126 | 98 | 105 | 98 | 103 | 107 | 92 | 89 | 87 | 31.7 |
| 15-24 | 106 | 101 | 109 | 99 | 89 | 101 | 89 | 88 | 110 | 20.8 |
| 25-34 | 107 | 100 | 111 | 94 | 107 | 89 | 93 | 91 | 111 | 22.5 |
| 35-44 | 100 | 103 | 112 | 98 | 102 | 85 | 96 | 89 | 101 | 33.2 |
| 45-54 | 103 | 106 | 104 | 96 | 98 | 99 | 96 | 97 | 97 | 62.3 |
| 55-64 | 102 | 105 | 107 | 99 | 97 | 97 | 98 | 89 | 89 | 129.7 |
| 65-74 | 108 | 112 | 103 | 105 | 102 | 92 | 92 | 87 | 88 | 238.7 |
| 75+ | 119 | 123 | 95 | 99 | 103 | 105 | 108 | 104 | 79 | 339.1 |
| Total | 107 | 105 | 101 | 98 | 98 | 96 | 95 | 90 | 90 | 64.4 |

Figure 2. Percentage increase in the mean annual age-standardized leukemia death rate in white persons between 1938-42 and 1949-53.



plex found in the earlier time period is largely the result of comparatively higher rates in the States in the East North Central division and lower rates in the Mountain States.

The percentage increase in leukemia between 1938-42 and 1949-53 is illustrated in figure 2. The increase in recorded death rates between the two periods was greatest in those areas in which initial rates were lowest. For the southern States, this increase may be interpreted as due to a leveling out of those factors, diagnostic or otherwise, which were responsible for the initial low rates. In two areas, however, Vermont and the Mountain States, such a leveling out cannot be accepted as the whole explanation of the high percentage increase between the two periods since the process has gone beyond the point of equalization. Vermont in 1949-53, for instance, had the second highest leukemia death rate. Similarly, of the five Mountain States with increases above

75 percent, three (Idaho, Utah, and Nevada) had rates in 1949-53 well above the national average.

The probability that the increase in leukemia death rates in certain of the Mountain States is of different origin from that observed in other States with initially low rates is further suggested by the observation that in the Mountain States the rise has affected the second half of the period almost exclusively. This is shown in the two columns of table 1 which give mean annual increments in leukemia death rate for 1938-45 and for 1946-53. In the southern States with large increases, the increase has occurred in both time periods, whereas in Utah, Arizona, Idaho, and Montana the increase has affected the second period predominantly. During 1946-53, two of these States experienced a rate of increase greater than that experienced by any other State in the same or the preceding 8-year period.

In the period 1949-53, the leukemia death rate recorded in certain States of the United States was more than $1\frac{1}{2}$ times as high as that in other States. It is not to be expected that the geographic pattern should be explained in terms of any one variable or influence or even that there should be any one overall pattern. In fact, several separate trends are evident.

First, reference has been made to the partial consistency of the findings with previous reports of high leukemia incidence associated with the social complex which includes urbanization, higher income, better medical care, and more accurate diagnosis. How much of the association of leukemia with this complex is directly attributable to the last component, more accurate diagnosis, is conjectural.

The fact that leukemia death rates in the individual States were more closely correlated with physician:population ratios than with either income or urbanization suggests that diagnostic differences are important. However, the difference between the correlation coefficients for physician density and income was not significant. In addition, while close association with measures of medical care suggests, first of all, differences in diagnostic standards, the possibility mentioned elsewhere (13) that some feature of medical care is itself leukemogenic cannot be overlooked.

It is evident, however, that as a determinant of the geographic pattern of leukemia death rate, the importance of this association has diminished over the time period 1938-53. Correlation coefficients measuring the association in the period 1949-53 were almost half those for 1938-42. This is consistent with the wider distribution of medical care occurring during this period.

A second feature of the geographic pattern is the belt of relatively high leukemia death rates covering the northern half of the United States west of the Mississippi River. This belt is seen in both time periods, although it is more marked in the second. It is clearly not the result of the association with physician density or urbanization discussed in the previous paragraph; in fact it would appear to be evident in spite of this, notably, for example, in Montana and Idaho, both of which have leukemia

death rates of more than 72 per million, and only 94 and 77 physicians per 100,000 population, respectively. Highest rates in this belt were in Minnesota. In fact, in both time periods, Minnesota had the highest death rate of all the States, and by a comfortable margin. Minnesota is, of course, the seat of important medical graduate and postgraduate teaching centers. These could explain the especially high rate in this State on a diagnostic basis, but it could not account for the much wider plateau of high leukemia incidence of which the Minnesota rate is the peak. It should be noted that Minnesota as a whole has a physician:population ratio no higher than the national average.

A third area of interest centers around certain of the Mountain States, particularly Nevada, Utah, Arizona, Idaho, and Montana. The interesting feature here is not so much the present level of the death rate as its recent rate of increase. The leukemia death rate in the area covered by these States almost doubled in the 8 years 1946-53. The rate of increase in this period was high in each of these States, and in two of them (Montana and Idaho) exceeded that experienced by any other State in the same or in the preceding 8 years.

The increase is not explained by changes in the age distribution of the population although there has been considerable migration into certain of these areas during the period concerned. To what extent the increase can be attributed to improvement of diagnostic facilities is uncertain. Examination of the trends for certain other causes of death (duodenal ulcer, diabetes, cancer of the stomach, uterus, and breast), diagnosis of which is also dependent on laboratory facilities, did not reveal any short-term change during this period. Of course, this does not eliminate the possibility of changes in the specific type of facility upon which the diagnosis of leukemia depends.

In 4 of these 5 States, Eisenbud and Harley noted the greatest levels of radioactivity deposited from atomic tests in spring 1952 (14). This fact suggests at first sight the possibility that this source of radioactivity has contributed to the increase in leukemia death rates. The possibility is eliminated however by closer consideration. First, after the initial explosion in New Mexico in 1945, a relatively small one, no

tests were conducted in the United States until 1951 according to the Office of Public Information, United States Atomic Energy Commission. The upward trend in leukemia death rates commenced about 1947-48. Second, a later publication of Eisenbud and Harley showing cumulative radioactive fallout to January 1955 discloses much less correspondence to the pattern of leukemia increases than did the pattern from the single test series recorded previously (15). Third, as reviewed by the same authors, the presently available evidence suggests that the biological effect of fallout in the amounts observed is trivial.

The trend of leukemia mortality in these States in the next few years deserves continued attention.

Summary

United States vital statistics for 1949-53 are used to compare age-standardized death rates from leukemia in the different States and divisions of the United States. Areas are also compared with respect to the increase in leukemia death rate noted since an earlier period (1938-42). The following features are noted:

1. Some of the geographic pattern of leukemia mortality is explicable in terms of the association of leukemia with urbanization, higher income, and better medical care. The importance of this association seems to have diminished in the decade between the two periods examined.

2. Independent of this, there is a belt of high leukemia death rates in States in the northern half of the country west of the Mississippi.

3. In an area covered by five contiguous Mountain States (Nevada, Utah, Arizona, Idaho, and Montana) the leukemia death rate almost doubled in the 8 years 1946-53. Two of these States individually had greater rates of increase during this period than any other State in the same or in the preceding 8 years.

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Public Health and the People's Health

By ERNEST M. GRUENBERG, M.D., Dr.P.H.

PUBLIC HEALTH is part of civilization's fight for a better life. With civilization comes an organized, conscious effort to change man's relation to his physical and social environment.

Civilization's fight against disease, specifically, seeks to cheat death for a brief space and to protect man from nonfatal diseases that produce illness. This is done by inventing specific ways of preventing disease. It is strengthened by a social movement to put these inventions to work on a broad scale. The specific public health movement, 100 years old, has created responsible armies of workers and organizations to see that existing inventions are applied and new inventions are made.

The three main forces affecting the level of a people's health are the natural hazards to survival and their distribution, the level of civilization, and the advance of public health.

The history of man's health, which still remains to be written, will describe what is known about the milleniums during which man was at the mercy of natural hazards with little understanding of what they were and with no effective means of acting against them.

Dr. Gruenberg, a member of the technical staff of the Milbank Memorial Fund, New York City, was executive director of the New York State Mental Health Commission from 1949 to 1954. A full version of this paper, here somewhat abridged, was delivered May 2, 1956, in Columbus, Ohio, at the joint meeting of the Middle States Public Health Association and the Ohio Public Health Association. States in the former group are Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

The next great period will deal with advancing civilization and the increasing effect of technology on raising living standards and averting famines.

The past century accelerated the advance of public health. Simultaneous with the development of techniques for organized health campaigns, public health movements have become pandemic in Europe and North America. Knowledge has been increasing at a phenomenal rate, giving public health ever more powerful weapons. This new power will raise new responsibilities and require repeated self-examination regarding their nature.

In Ceylon, life expectancy at birth gained nearly a year per year for the 6 years beginning in 1947. A similar rapid rise in life expectancy occurred also in Japan and Puerto Rico while in some other areas, although more favorably situated, populations have not shown such dramatic changes (1).

One implication of these phenomenal successes is that whereas public health formerly represented a late stage in technical development, working effectively to supplement industrialization and to mitigate the harmful consequences of urbanization, new knowledge has made it so powerful that it can precede other forms of social progress.

Another implication is that, while advances in health have often served to assist the process of social development, public health never before had the power to create radically new patterns of disease and mortality, relatively unassisted by general rises in the level of living.

In some places health protection and promotion have become the chief instruments for producing rises in the level of living and in releasing uncounted millions of lives for productive labor.

To the epidemiologist this means that the distribution of organized health movements has become the chief factor in understanding the distribution of many diseases and the pattern of human mortality.

Charting the Future

These and other signs of the power of organized public health are so much on our minds, and respect for its power to effect changes in the people's health is so widespread, that the whole movement seems to be circling in a moderately dazed way in an attempt to find suitable targets on which to strike.

There are dangers in this situation. An example is the mental health movement which, since the war, has come into its own. Although to the administrator popularity may be a matter of envy, to the serious worker it soon becomes a matter of concern.

There is a danger that we come to believe that such popularity must be deserved.

There is a danger that we come to believe our enthusiastic supporters when they claim that we are capable of anything.

There is a danger that we allow ourselves to be held responsible for things we cannot do.

In a time when our power has increased we must remember our duty to inform the public of the sober realities of their health situation. Public health workers have always been long on faith and enthusiasm and at times short on facts and self-criticism. With the powerful weapons that are now available and the widespread faith and enthusiasm that are evident, the movement needs to strengthen its balance wheel of facts and self-criticism.

The suggestion that the next great chapter in public health should be centered on positive health and medical care can be misleading.

Medical care has become a powerful tool for reducing disability and postponing death in the presence of certain diseases. Furthermore, everyone has the right to expect the best available medical care when he is ill.

But, from the public health point of view, every case that comes to medical care represents a failure of a movement whose objective is to keep illness from occurring. Obviously, physicians in this country keep very busy in

spite of preventive medicine's great successes. Public health will not be doing its job unless it tackles the causes of morbidity and mortality which still plague the people.

Attacking Preventable Diseases

First, we must do what we know how to do. There are some vital gaps in civilization's battle against disease.

We have not found practicable ways of preventing all preventable diseases, diseases for which the technical means of prevention are well established. The great progress on which we compliment ourselves has affected a pitifully small percentage of the world's population. Malaria alone, a completely preventable disease, is still a great killer.

It is not only abroad that these gaps are to be found. Malnutrition, tuberculosis, venereal disease, excess infant and maternal mortality, and inadequate medical care and rehabilitation are often found in the United States in particular neighborhoods and sections of the population. Infant mortality in New York City, for example, is as high as 35 per 1,000 live births in 4 districts and as low as 17 in some districts of the city (2).

Retarded populations in this country suffer not only from poor health but also from poverty or ignorance. If public health is going to continue to work for the improvement of the people's health, it will concentrate on these populations.

One useful approach is the examination of patterns of differential mortality rates. Although we are working toward consistency and constancy in statistics on occupation and mortality, England has issued tabulations of mortality by social classes for several generations. While we have failed, perhaps, to be impressed by the fact that the standardized mortality ratio for the least favored populations in England and Wales is twice as high as for the most favored, we should be impressed by the fact that age-specific death rates for adult males are higher for each comparable age group in this country than in England. And we should be even more impressed by the fact that standardized mortality ratios vary more by occupational groups in this country than in England (3).

This is not the place to recommend solutions. It is important to recognize that these problems exist and that the measures available point unmistakably to unfinished business for public health.

Some of the specific areas for attention which might lead to a reduction of some of these differentials are well known. To list a few:

- Nutrition is not optimal for the entire population.
- Housing is not sanitary or safe for all.
- Fluoridated water is not yet available to most urban families.
- Medical care is not readily available to those who need it most. In particular, the aged frequently cannot afford the high costs of medical and nursing care. Often they do not receive the detailed attention that medical science can offer to preserve remaining functions.

Dr. Haven Emerson once propounded the theorem that the first step in public health occurred when man rose up out of his own filth. Although mankind has long since passed that early stage, it now finds itself surrounded by man's collective filth in air and water. The present movement to rid rivers, coasts, and city air of man-made pollution has scored some signal successes on a few small fronts. The staggering proportions of the problem and its implications for civilized life illustrate the old proposition that public health cannot "go it alone" but must act as a center of technical and community leadership for all the forces interested in the people's health and welfare.

Using Knowledge Fully

There are also some new frontiers for public health. Four major health problems—mental diseases, arteriosclerosis, cancer, and the common cold—serve to remind us that there are still diseases we do not know how to control and that there are some public health objectives we would like to reach but do not know how.

A proper humility before the forces of nature obliges us to recognize that we are powerless to prevent these conditions in the mass and that medical science can do little to change the course of most of these diseases once they are started on their way.

Our first obligation as professional health

workers is to know the facts. Our second is to communicate them intelligibly to the people we serve. Our third is to devise and execute schemes to put the limited knowledge we do have to effective use.

For example, though many prevention programs have been instituted in the mental diseases, most have ignored established knowledge.

In one State the mental health program is centered on human relations in the health department and in the schools. Some cases of pellagra psychosis occur each year, but the program does not consider control of these preventable cases to be its function. Nor does it concern itself with the preventable cases of neonatal brain hemorrhage caused by Rh incompatibility. Available knowledge strongly suggests that young infants and preschool children require stable family life for healthy personality development, but the program does not seek to prevent preschool children from being housed and fed in institutions or in a series of foster homes.

It would seem that the first item on any public health program must be the elimination of preventable instances of morbidity and mortality. But the bulk of mental illness today cannot be prevented by known techniques.

Can we shorten the duration of some mental cases? There is some reason for hope in this direction. Acute depressions in the involutional years are sensitive to shock treatments. Some neuroses of childhood seem to be relieved by quick responses by the adults in the child's environment. Mental deficiency is partly treatable.

Can we reduce the disability which mental illness produces? In many instances, yes. We know that we overhospitalize mental illnesses in a wanton fashion. We know that with good medical care many chronically ill people can live slightly impaired lives instead of hospitalized lives.

Programs which emphasize positive mental health often distract attention from the pluses and minuses in our knowledge. Mental health programs emphasize child guidance clinics, but the clinics generally prefer to see chronic neuroses rather than to try to see an acute neurosis while it is acute or to help a neglected infant. Programs emphasize building more hospitals

when the use of mental hospitals has become excessive. Psychiatrists are trained to treat the least ill rather than the chronically ill whose disability they could often reduce. Education programs are called preventive even when there is no real reason for believing they have any important preventive effects.

Avoiding Illusions

Parent education is necessary within reason, and child guidance clinics, adult psychiatric clinics, mental hospitals, psychotherapy for neuroses are both necessary and valuable. Perhaps the emphasis on these activities in existing mental health programs comes from an illusory kind of thinking. Some of these illusions have become our standard ways of avoiding unpleasant realities. To describe a few:

"Where there is a will, there is a way." This is true about carrying out an activity, but it is not true about achieving an objective. You may shout across the ocean with great will, but without a radio you will not be heard. You may educate parents with gusto, but you cannot be sure you have prevented any mental disease.

"Early diagnosis and treatment is secondary prevention because it shortens disease or reduces disability." This is a simple inversion of the true proposition that secondary prevention consists of early diagnosis and effective treatment. Ineffective treatment doesn't help arteriosclerosis. There is no real reason to think that early diagnosis and treatment can reduce morbidity or mortality in this disease.

"Activity is good." It isn't always.

"If one clinic doesn't help, get two." If one super anticold pill doesn't stop your cold, take two. If two don't help, take three.

"Doctrine of signs and names." This illusion consists of the belief that the name of an agency describes its effects. To stop the common cold, set up an anticold commission and give it the assignment of stopping colds. If the incidence of colds goes up the first year, enlarge the agency the second. After staff has obtained tenure and the rates are still rising, have a shakedown, change the name, and bring in a director who has impressive qualifications. The chances are that you will get a competent staff who think the common cold is a bad thing,

who will probably find ways of reducing the amount of headaches and coryza, who may produce some skin-tanned children by lighting classrooms with ultraviolet lights, and who will increase the sale of nasal paper tissues, and decrease the sale of pocket handkerchiefs. They will keep busy and do some useful things, but they probably won't have much effect on the number of people who suffer from the common cold.

The reason is obvious: They don't have the knowledge; they don't have the techniques. In spite of good scientific training in tailoring means to fit ends and in learning to recognize facts as facts, the best intentioned of us get carried away by the desire to effect changes, to slay the wicked dragons. When ignorance or difficulties frustrate, we switch goals and develop formulas for self-justification.

These are some of the current thoughts of one mental health worker regarding the future of public health. The objective of public health work is to control disease. The value of public health activity depends entirely on its success in achieving that objective. As techniques become more powerful and as health organizations become larger, the responsibility for keeping track of our successes and failures becomes greater.

The successes of the past can guide us, but the successes of the future will be even greater and will demand as much originality and steadfastness from public health workers.

The people's health is becoming increasingly more subject to the control of public health, but the people's health still manages to vary in ways which public health has not yet been able to control.

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Epidemiological Methods and Inferences in Studies of Noninfectious Diseases

By ABRAHAM M. LILIENFELD, M.D., M.P.H.

DURING THE PAST FEW YEARS, the epidemiological approach has been applied increasingly to the study of noninfectious diseases, such as cancer and heart disease. Various methods of study have been used, and various inferences have been derived from the observations. In several instances, such as the relationship between lung cancer and cigarette smoking, the inferences have provoked considerable discussion. This in turn has led to consideration of certain selected aspects of the conceptual framework of these inferences (1-5). However, there still exists a need for a more general review of the methodology and of the considerations that may influence the derivation of inferences from the observations. This paper intends to provide such a review, although it does not pretend to cover all aspects of the subject. This review may give perspective on some of the issues involved. It may stimulate further discussion and investigation so that the methodological problems confronting us can be gradually resolved.

Uses and Sources of Data

Epidemiology may be defined as the study of the distribution of a disease or condition in a population and of the factors that influence this distribution. Thus, the epidemiologist is in-

terested in variations in frequency of diseases by such characteristics as age, sex, race, social class, and occupation. This knowledge is useful for the following reasons:

1. It permits the development of hypotheses concerning etiological factors. Thus, if the disease is observed to be more frequent in a particular population segment than in others, hypotheses are developed to explain this increased frequency.

2. It can be used to test hypotheses developed in the laboratory or clinic. It is important to determine if an etiological hypothesis, based on laboratory or clinical observations, is consistent with the known distribution of the disease in human populations; to the extent that it is not consistent, the hypothesis will have to be modified.

3. It provides the scientific basis for public health administrative measures to control the disease. Even if knowledge of etiological factors is inconclusive or erroneous, epidemiological data may still be used for such control measures as case finding and the early detection of affected individuals.

The present discussion will be concerned principally with the use of epidemiological observations to elucidate etiological factors.

An epidemiological study provides data from which may be derived a series of statistical associations between a disease and various characteristics of the population. From this pattern of statistical associations, biological inferences may be drawn. The totality of the associations and the inferences constitutes the epidemiology of a disease. Thus, the epidemiological method consists of two stages: first, the

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determination of one or more statistical associations; second, the derivation of inferences or hypotheses from the series of associations.

Two distinct types of studies are used to determine statistical associations: studies of demographic data and studies of individual history data. The latter may be divided into three general categories: retrospective studies, prospective studies, and experimental studies. Of these latter, only the first two will be examined in this review. Both of these concern observations of naturally occurring phenomena, and the investigator has no direct control over other possible factors that may influence the associations so determined. Properly designed human experiments are the only certain way of establishing an association between a disease and a characteristic. However, opportunities for carrying out such studies are rare.

Demographic Studies

Demographic data are obtained principally from routinely collected vital statistics reports. They provide information concerning the distribution of either mortality or reported cases in time, by age, sex, race, social class, and other characteristics. Such data may differ from data based on individual histories in several respects. For example, demographic data may show an association between two events in time, whereas individual history data may show that an individual with a certain characteristic also has another characteristic; the latter is more likely to reflect a biological relationship. Also, certain demographic data, such as socioeconomic data, may deal with average characteristics of a group of individuals rather than with the characteristics of each individual.

Associations based on demographic data are of value in furnishing a lead for more detailed investigations. However, they must be interpreted with caution because of questions concerning the accuracy of death certification, reporting practices, and the like. General familiarity with demographic data makes further discussion unnecessary.

Retrospective Studies

The retrospective approach consists of obtaining a group of individuals with the disease,

which we shall call B, and determining the percentage of these individuals who have the characteristic A, which is considered a possible etiological factor. This frequency is then compared with a similar frequency in a so-called control or comparative group of individuals without the disease. If the frequency of A is higher among those with B than among those without B, an association is said to exist between A and B. In such studies, the cases (with B) and the controls (without B) can be selected in several ways.

Hospital Populations

Most frequently, both the cases and the controls are obtained from hospital populations. Practically all the retrospective studies indicating an association between lung cancer and cigarette smoking have been hospital studies. Control groups usually consist of patients with other diseases admitted to the same hospital or hospitals. This method's popularity results from the ease and inexpensiveness with which data can be obtained. In evaluating this method, several factors must be considered and their relative importance judged by the investigator.

Probably the most frequent problem encountered in studies of hospital populations results from the influence of what is termed "selection." In this connection, it will be helpful to distinguish "sampling selection" and "biological selection." When selection is discussed in this type of study, sampling selection is usually meant. The question of biological selection will be considered later. Berkson has shown the possibility of obtaining a spurious association of A and B because of sampling selection resulting from differential rates of admission to the hospital of individuals with A, those with B, and those without B (6). However, Berkson (6) and Kraus (7) have also indicated that if characteristic A does not influence the admission of individuals to the hospital, the likelihood of a spurious association is negligible.

Decision as to whether A does or does not influence admission to a hospital may at times be difficult. To a large extent, we are dependent on the judgment of the investigator and on our general knowledge of the specific situation,

making evaluation of the results difficult. In many instances we may feel that a specific characteristic A does not influence hospitalization, but this may result from ignorance of all of the related variables involved. For example, if we are interested in determining a possible relationship between eye color and a specific disease, and we find an association between blue eyes and a disease in a hospitalized series of cases and controls, it does not appear likely that individuals with blue eyes would be selected for hospitalization. However, if we are in a community in which the ethnic group with blue eyes is predominantly in the lower social strata and if social class influences hospitalization, it is possible that sampling selection may operate to such an extent as to result in a spurious association of a disease with blue eyes.

In determining the importance to be assigned to the influence of sampling selection, another factor that must be considered is the strength of the observed association. In the extreme case, if we find that all the B individuals have A and all the non-B individuals do not have A, it would be very difficult to deny the existence of an association between A and B, unless the characteristic A exerts an unusually large influence on the chances of hospitalization. Unfortunately, most associations are not this strong. Hence, it may be helpful to judge the relative importance of sampling selection by determining arithmetically how much of an association could be expected for varying degrees of sampling selection; we shall illustrate this in our discussion of prospective studies. If the degree of the association is much greater than could be expected after taking into account what may be considered a reasonable influence of sampling selection, the association may be more readily accepted. Objections to this approach might be raised since it is not as clear cut as is usually deemed desirable. However, an element of judgment is always present in the evaluation of any set of data, regardless of the source.

In many hospital studies, confidence in an observed association may be increased by the presence of internal evidence. For example, if several non-B groups, each with a different disease or condition, are compared with the B group and the results with regard to character-

istic A are similar, confidence in the existence of an association can be greater than if only one non-B group is used. Also, confidence may be greater if there is a relationship between the frequency of B and the amount of A, provided that A can be quantified. In general, the more ways in which an association can be shown, the greater can be our confidence that it is a real one and not a result of such a disturbing factor as sampling selection.

Clearly, the determination of a statistical association by hospital studies poses many difficult problems, since an interpretation concerning the existence of a relationship depends largely on the investigator's judgment regarding the plausibility of other explanations for the observed association. A point frequently overlooked is that disturbing factors actually may operate in the opposite direction so that a true association is obscured as a result of sampling selection. One might argue that this situation would occur only if the association were not a very strong one and, therefore, not very important. However, in seeking clues about etiological factors, no possible associations should be overlooked.

Controls From General Population

A modification of the hospital studies is the use of a control group selected from the general population and matched with the hospitalized cases according to certain characteristics. Usually, such a control group consists of individuals who reside in the same area and are similar in age, sex, and race to the hospitalized cases. A matched population control may diminish some of the difficulties resulting from the possible disturbing effect of sampling selection, but it is not completely clear as to how much really is accomplished. It is principally on intuitive grounds that such a control is regarded as better than a hospital control.

In some situations it is possible that a matched population control group is worse than a hospital control group. If characteristic A is another disease or condition requiring medical diagnosis for its determination, the objection could be raised that matched population controls differ from hospitalized patients with regard to the amount of medical care received. For example, in studying the association of can-

cer of the cervix with diabetes, we would carry out a retrospective study with hospitalized cervix cancer patients from whom we obtain a history of diabetes. A matched population control may be completely inadequate for comparison with the patients since the patients and controls would differ with regard to the amount of medical care received, and, therefore, the matched control group may actually have a larger proportion of undiagnosed cases of diabetes. This situation will arise if the information concerning diabetes is obtained by interview. However, if the presence of diabetes is determined by examination, this difficulty will not be encountered. Consequently, if it is necessary to obtain the required information by interview it may be preferable, in certain instances, to use hospitalized patients as the controls.

A control group for comparison with a hospital case group can also be obtained by selecting a random sample of the population and adjusting for differences in sex, race, age, and other variables by available statistical techniques. The question of whether to use matched or randomly selected controls has been discussed most recently by Cochran (8) and Greenberg (9). Apparently, each method has certain advantages and disadvantages, with the random sample having a slight edge. The problem of diagnostic comparability mentioned in the case of matched population controls also occurs with regard to a random sample control group.

Cases and Controls From General Population

To avoid problems imposed by sampling selection, the best approach would seem to be to obtain a sample of all cases in a community and to select either a matched or random sample of the general population as a control group. However, when samples of the general population are used, the cases and controls are again not comparable from the viewpoint of medical care. Consequently, if we are interested in determining the frequency of a characteristic that is influenced by the amount of medical care received, a more appropriate method of determining this characteristic than interviewing must be used. Selection of cases and controls from the general population appears preferable to other methods of selection in that, with this

method, it is least necessary to depend on judgment concerning the relative weight to be assigned to the influence of sampling selection and other possible disturbing factors.

It is remarkable that this kind of study has not been used in epidemiological investigations of noninfectious disease more frequently than it has. The only drawback is that such studies are more difficult, expensive, and time-consuming than studies of hospitalized cases. Despite the obvious advantages, it must be admitted that theoretically this method does not avoid all possibility of sampling selection, since it might be argued that "all cases" includes only "all known cases" and undiagnosed or asymptomatic cases may have been selectively omitted with respect to the variable under study. After hospital studies have indicated the existence of associations, it would appear more profitable to expend funds and energies on confirmation by general population studies than to continue repeating hospital studies ad infinitum.

Additional Considerations

In retrospective studies, information is usually obtained by interview. Interviewing as a method of measurement has a fair amount of error, which, among other things, results in a certain amount of misclassification of individuals with and without the characteristic under study. Bross has pointed out that the ability to detect differences in the frequency of a characteristic in two groups decreases with increasing amount of misclassification (10). Thus, in retrospective studies, where there always will be some degree of misclassification, there is a certain risk that a true association will not be detected. This lack of sensitivity has not been sufficiently realized. In addition, the possible intrusion of subjective bias, both conscious and unconscious, must not be overlooked. When a history of a characteristic is obtained and the interviewer knows which individuals are the cases and which the controls, it is difficult to be certain that the differences observed between the two groups are not the result of subjective bias.

Retrospectively obtained data can be further evaluated by noting if the results are consistent with those obtained by demographic studies. Consistent findings will increase the confidence in the existence of observed associations, but it

is difficult to determine the degree by which such confidence will or should be increased.

Prospective Studies

In prospective, or followup, studies groups of individuals with and without the characteristic A are obtained and followed for a definite period of time to determine the risk of developing B when the characteristic A is present as compared with the risk when it is absent. These groups may be selected from the population in either a random or a nonrandom manner. Several practical considerations must be taken into account in the actual process of selection. For example, if the characteristic A is very frequent in the population, a completely random sample of the population may not be the most efficient method of selecting the two groups, since the number of individuals without A in a random sample may be too small. To increase the number of individuals without A, it may be necessary to select more of them from the rest of the population by matching with the individuals with A in the random sample. A similar situation may occur with an infrequent characteristic. If we are interested in prospectively studying the association of diabetes with cancer of the cervix, it would probably be best to select a random sample of diabetic patients in the community. Then we could select either a matched control group of nondiabetics or a random sample of the entire population from which we could obtain a control group of nondiabetics by further sampling and perhaps matching. In general, the method of selection depends largely on the particular characteristics being studied.

If a nonrandom sample is used, sampling selection may be a disturbing factor. Berkson indicated this possibility in an analysis of some of the prospective studies of the association of cigarette smoking with lung cancer (11). In these studies, nonrandomly selected groups of smokers and nonsmokers were followed for a certain period of time, and it was observed that the death rate from lung cancer was higher among smokers than among nonsmokers. By numerical illustration, Berkson demonstrated that sampling selection may produce a spurious association. From other sources, he obtained

estimates on the frequency of smokers in the population. This frequency was different from that in the study population, indicating that sampling selection had taken place. Berkson then demonstrated that this degree of sampling selection would result in a lung cancer death rate among smokers that was 1.5 times that found among nonsmokers. However, according to a report on the prospective studies by E. C. Hammond, the observed rates among smokers in the 4 age groups studied are from 3 to 17 times the rates observed among nonsmokers. For such a difference to be a result of sampling selection, it would be necessary to assume a degree of selection that apparently was not present in these studies. This example is presented to indicate the need for evaluating the strength of the association in relation to the degree of sampling selection that could have occurred. As in the case of retrospective studies, judgment must be exercised in the evaluation of the data.

The followup method of study has several advantages. First, it provides a direct estimate of the risk of developing the disease B when A is present, whereas in the retrospective method this can only be obtained indirectly. It is not certain how advantageous this really is when the major objective is to try to determine possible etiological factors. But some investigators prefer direct rather than indirect estimates. Second, a prospective study decreases the risk of subjective bias, provided that the criteria and procedures are established in advance. Third, it decreases the likelihood of misclassifying individuals with and without the characteristic. For example, in determining the relationship of artificial menopause to female breast cancer retrospectively, we are dependent on a history of artificial menopause. In a certain proportion of cases the history would be erroneous. However, in a prospective study we would start with individuals who currently have an artificial menopause; therefore, there would be no misclassification of these individuals. This tends to increase the chances of finding an association if one actually exists.

Observations to Increase Confidence

In either a retrospective or a prospective study, confidence in observed associations may

be increased by including individuals who had characteristic A initially and then lost it. For example, in the studies on cigarette smoking and lung cancer, there were individuals who had been smokers and then had become nonsmokers. Therefore, it is possible not only to compare cigarette smokers and nonsmokers with regard to the risk of developing lung cancer, but also to determine the risk for individuals who were smokers and then became nonsmokers. E. C. Hammond reported that for this group the risk of lung cancer is less than for those who remained smokers. This is a valuable observation since it is less likely that such factors as sampling selection are responsible for this type of an association.

Additional confidence in the observed associations may be obtained also by comparing the affected groups and controls or those with a characteristic and without a characteristic with regard to as many other variables as possible. On the question of smoking and lung cancer, it would be of considerable interest to see if smokers and nonsmokers and if the lung cancer cases and the control groups are alike with regard to such characteristics as alcohol consumption, family size, occupation, and the like. Except for occupation, such comparisons are not yet available. This is one major methodological criticism that could be leveled at lung cancer studies. The more characteristics with regard to which the groups are similar, the more certain can one be that the difference with regard to smoking habits is real. However, the present level of epidemiological knowledge sets a limit in determining the characteristics to be selected for comparison. There is a risk of stating that the two groups are comparable with regard to characteristics that may eventually turn out to be unimportant. As knowledge of the epidemiology of a disease increases, it can be used continuously to evaluate more properly previously determined associations.

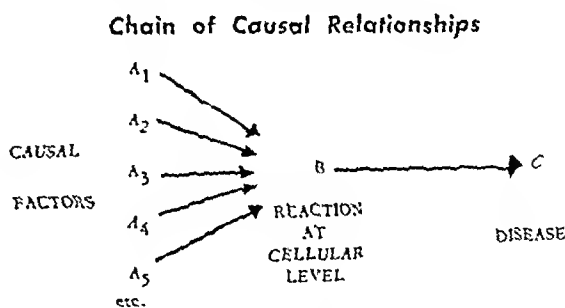
Causality in Biological Phenomena

After a statistical association has been ascertained, we would like to make some sort of an inference as to whether a cause and effect relationship exists between the disease and the associated characteristic. Before discussing fac-

tors that influence this type of inference, we need to consider the concept of causality.

In medicine and public health it seems reasonable to adopt a pragmatic concept of causality. One major reason for determining etiological factors of human disease is to use this knowledge to prevent the disease. Therefore, a factor may be defined as a cause of a disease, if the incidence of the disease is diminished when exposure to this factor is likewise diminished.

This concept is not as logically rigorous as the more formalistic one held by some investigators, which requires evidence indicating that a factor is both a necessary and a sufficient condition for a disease before it is incriminated as a cause. In biological phenomena, both these requirements do not have to be met because of the existence of multiple causative factors. For example, in tuberculosis, the tubercle bacillus is a necessary but not a sufficient condition for tuberculosis. Other additional factors included under the term "susceptibility" are important. In other infectious diseases, the micro-organism is a necessary factor but not always a sufficient one. In diseases generally considered as noninfectious, such as cancer, the concept of causation may have to be broadened further, since one particular etiological factor may not even be a necessary one because of the probable existence of multiple causative agents.



Actually, in both infectious and noninfectious diseases the differences in these two concepts of causality depend upon the frame of reference. To illustrate, the cause and effect relationships with multiple etiological factors, labeled A_1 , A_2 , A_3 , and so forth, each acting independently, are presented in the accompanying drawing. These factors can be looked on as producing a change

in B at a cellular level. The changed cell B could then develop into C, the disease. Clearly, the cellular change in B can be considered as the necessary and sufficient condition for the disease C. Therefore, to meet the more rigorous definition of causality, the biological mechanisms relating A to B and B to C must be determined. Pragmatically, however, the determination of each of the A factors is important, since attention must be focused on these to be able to apply preventive measures.

The derivation of causal inferences from observed statistical associations is difficult because of the inability to eliminate the possible effect of another variable that may influence both the characteristic A and disease B. For example, in the cigarette smoking-lung cancer relationship, it is possible to postulate the existence of another factor that causes a person to smoke and also causes lung cancer. Or perhaps there exists some constitutional factor among non-smokers that decreases their risk of developing lung cancer. The latter viewpoint is not unreasonable since there is a tendency for persons participating in athletics not to start smoking at that time of life when smoking habits are developed. Such individuals may be constitutionally hardier as shown by their participation in athletics, and perhaps this constitutional factor decreases their risk of developing lung cancer. If such relationships exist, they would result in a statistical association without a causal relationship. This situation may be termed biological selection since individuals are selected for both the characteristic and the disease by a third mutually related factor. Similar problems are encountered in many fields, such as genetics and sociology (12, 13).

Biological Considerations

One important biological consideration that may influence the derivation of causal inferences concerns the ability to experiment. If one can select samples of individuals from a population and randomly allocate them to two groups, one with and the other without the characteristic, and the statistical association continues to exist, the randomization procedure has taken into account most, if not all, of the other related variables. Such well-controlled

experiments had a major role in establishing a causal connection between fluorides in drinking water and reduction in dental caries. However, experimentation is not usually feasible in most human diseases.

Another influential factor is the degree of the observed association. If the statistical association is very strong, it is less reasonable to suppose that a mutually correlated third factor was involved. Admittedly, a 100 percent association does not completely eliminate the possible existence of a third factor, but it does make such a possibility more unlikely. Here again, such a situation is rarely encountered.

Probably the most important consideration is whether or not the association is consistent with existing biological theory. If a statistical association makes biological sense, it is more readily accepted than one that is at the moment not capable of biological explanation. By "biological sense" we mean that the mechanisms leading from the characteristic A to the disease B fit into some biological (physiological or pathological) framework. If this framework exists, it was probably derived from other kinds of observations; therefore, it is intuitively felt that the association has been verified by other, independent observations.

This type of reasoning can be illustrated from studies of pregnancy experience and neuropsychiatric disorders in childhood (14). In these studies an association was demonstrated between certain maternal factors during pregnancy and the development of such disorders as cerebral palsy, epilepsy, and mental deficiency in the offspring. This association fits into a reasonable biological framework since the mechanisms of such relationships are readily conceived. These same factors have been shown to produce anoxia in the fetus, and anoxia may result in damage to the brain, which, in turn, is logically related to the disorders mentioned. Consequently, the statistical association is readily acceptable as a causal hypothesis.

On the other hand, in the association of cigarette smoking and lung cancer, no direct links between cigarette smoking and cancer have been worked out. There is evidence indicating that environmental agents are important in the etiology of cancer, which does strengthen the hypothesis that cigarette smoking and lung

cancer are causally related. It also seems more reasonable to accept cigarette smoking as a causal factor than the application of a certain ointment to one's feet or the ingestion of alcohol, since cigarette smoke does come in contact with the site of lung cancer. But the biological plausibility of a causal hypothesis on these two bases is not of the same order as in the case of pregnancy factors and neuropsychiatric disorders.

There are historical instances in which a statistical association did not originally conform to existing biological concepts. As advances in knowledge changed the biological concepts, these new concepts were found to be consistent with the previously observed association. Conversely, there have been instances in which the statistical association was interpreted as being consistent with existing biological concepts, but later the interpretation of the association was found to have been erroneous.

The classical example of the first situation is afforded by Snow's investigation of cholera (15). Snow observed an association between the ingestion of polluted water and the development of cholera during 1819-54. At that time, prior to the establishment of the germ theory of disease, the accepted etiological hypothesis for cholera was the miasmatic theory. Snow's observations were not generally accepted since they did not conform to the miasmatic theory. After the germ theory of disease was established, Snow's statistical association was consistent with the germ theory, and, hence, it was accepted. Thus, the prevailing biological opinion was erroneous whereas the inference made from the statistical association was not.

The second situation is exemplified by Farr's observation of an association between elevation of residence above sea level and cholera mortality in London (16); his data, for 1848-49, are shown below. With increasing elevation, there was a decline in cholera mortality. This association was consistent with the miasmatic theory and was interpreted as confirmatory evidence. When the miasmatic theory was replaced by the germ theory, this association was still reasonable since elevation was in turn inversely associated with the etiological factor, polluted water.

| <i>Elevation above sea level, in feet</i> | <i>Deaths in 10,000 inhabitants</i> |
|---|---|
| Under 20----- | 162 |
| 20-40----- | 65 |
| 40-60----- | 34 |
| 60-80----- | 27 |
| 80-100----- | 22 |
| 100-120----- | 17 |
| 340-360----- | 7 |

One other biological consideration is the role of animal experimentation. There is a widespread feeling that, if a statistical association is confirmed by an animal experiment, definite proof of a cause and effect relationship in humans is established. It is important to realize that applications of the results of animal experiments to human situations are fraught with danger. If we are concerned with such disturbing influences as sampling and biological selection in studies of humans, we should be so much the more careful of basing conclusions on results of animal experiments. Confirmation by animal experimentation increases the biological reasonableness of a causal inference. It also provides an animal model by which possible biological mechanisms may be elucidated, thereby indicating how and where such mechanisms might be investigated in humans. But, in interpreting results from animal experiments, it is important to distinguish between definite proof and increased biological plausibility.

Nonbiological Considerations

Certain nonbiological considerations may influence an individual's attitude toward acceptance of a causal inference. These concern the decisions that are made relative to the course of action to be taken when an inference is accepted. They reflect the outlook, background, and administrative responsibilities of the individual. For example, a research scientist, without any direct responsibility for the health of a population, might require a very high degree of plausibility before accepting a causal inference and recommending definite administrative action. On the other hand, a health officer, directly responsible for the health of a population, may accept a lower degree of plausibility as sufficient to warrant preventive action. He may therefore accept a causal inference when he thinks that it has a good chance of being correct but before it is definitely proved.

Such considerations usually play a role after the statistical association is established and before a causal relationship is definitely proved. During this period, causal inferences are regarded with varying degrees of plausibility. It is helpful to consider the possible relationships between courses of action and degrees of plausibility, as follows: At the first level, the evidence is considered sufficiently suggestive to warrant further investigation. At the second level, the evidence is considered sufficient for recommending attempted preventive action. At the third level, the evidence is considered sufficient to state that a causal inference has been proved, and this causal hypothesis is included in our body of scientific knowledge. There is an interaction between the degree of plausibility with which an inference is regarded and the actions based on these inferences.

It seems that the present controversy over the inferences from the cigarette smoking-lung cancer association is largely concerned with the degree of plausibility. It is generally agreed that the evidence is sufficiently suggestive to warrant further investigation. At the other extreme, there is general agreement that the evidence is not sufficient to warrant a statement that a causal hypothesis is definitely proved; this level will not be reached until the detailed biological and chemical mechanisms have been worked out. At present, the major issue is whether a causal inference is sufficiently plausible for a public statement that cessation of cigarette smoking would diminish the risk of acquiring lung cancer. Since the degree of plausibility cannot be directly assessed, differences of opinion naturally develop.

In evaluating these decision levels, it is important to keep in mind that in many instances action based on a statistical association could be successful even though it is interpreted incorrectly from a biological viewpoint. To illustrate this we recall Farr's observation of the association of decreasing cholera mortality with increasing elevation of residence above sea level (16). If the health officer had recommended that people living in the lower-lying districts of London move to the higher districts, a decline in cholera mortality would probably have resulted, although such action would have been based on the erroneous miasmatic theory.

Summary

Increasing use of the epidemiological approach in the study of noninfectious diseases emphasizes the need for considering the conceptual framework of such studies. Epidemiological studies are composed of two stages: first, the determination of statistical associations between a disease and various population characteristics; second, the derivation of biological inferences from the pattern of associations. Both the associations and inferences constitute the epidemiology of the disease.

Statistical associations may be determined from demographic data or from individual history data. The latter may be obtained from retrospective studies, prospective studies, or experimental studies. In these studies, characteristics of a group of cases are compared with those of one or more groups of controls. Cases and controls may be selected by various methods, each of which has advantages and disadvantages.

In general, leads to the existence of statistical associations come from individual history studies of hospital populations or from demographic data. The associations so suggested require confirmation by retrospective studies of adequately selected samples of cases and controls from their respective populations. Whether or not prospective studies are necessary depends largely on the kind and strength of the association. The method of carrying out a prospective study depends on the nature of the characteristics and the disease under investigation.

In the derivation of causal inferences from observed statistical associations, certain biological and nonbiological factors are influential. Among the biological factors are the ability to conduct human experiments, the strength of the association, the role of animal experimentation, and the prevailing biological concepts. The latter is the most important. Snow's and Farr's observations on cholera are illustrations of the interaction between biological theory and the interpretation of statistical associations. A nonbiological factor is the course of action resulting from the degree of plausibility with which a causal inference is regarded. This factor, directly or indirectly, influences an in-

cancer are causally related. It also seems more reasonable to accept cigarette smoking as a causal factor than the application of a certain ointment to one's feet or the ingestion of alcohol, since cigarette smoke does come in contact with the site of lung cancer. But the biological plausibility of a causal hypothesis on these two bases is not of the same order as in the case of pregnancy factors and neuropsychiatric disorders.

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Personnel Shortages in the Health Field and Working Patterns of Women

By WALTER L. JOHNSON, Ph.D.

ALTHOUGH it is well known that large numbers of women are attracted to the health and medical care field, the numerical extent of their employment and the trends toward their greater participation are not always recognized. In 1940, about 58 percent of all workers in the health field were women; by 1950, this proportion had increased to 63 percent (1a), distributed by occupation as follows:

| Occupation | Percent women |
|---------------------------|---------------|
| Professional worker..... | 63 |
| Service worker..... | 66 |
| Clerical worker..... | 91 |
| All other (residual)..... | 35 |

With the exception of the residual occupations, which constituted only about 9 percent of all workers in the health field, women predominated by a ratio of two or more to one.

A more detailed analysis of the professional group in the health field in 1950, including those in medical and other health services and in hospitals, reveals a similar pattern for specific professional occupations, except medicine and dentistry. The percentages of women in selected professions (1b, 2) are:

| Profession | Percent women |
|------------------------------------|---------------|
| Nurse, registered and student..... | 98 |
| Dietitian, nutritionist..... | 97 |
| Social worker..... | 81 |
| Medical technician..... | 60 |
| Physician..... | 6 |
| Dentist..... | 3 |

If physicians and dentists are excluded, about 9 out of 10 professional workers are women, a ratio which might surprise even those most familiar with the characteristics of health personnel.

This paper proposes to defend and emphasize the proposition that these facts identify a whole area of study which is relevant and significant to better understanding and control of personnel shortages in the health field today. Such an emphasis is needed for the reason that insufficient attention has been given to exploring the effect of this kind of sex ratio on the personnel turnover problem—either from the standpoint of measuring its relative influence on the entire personnel problem or of formulating possible courses of action in which this sex ratio is taken into account.

Of course, in a general way, it is widely recognized that the presence of women in significant numbers in any industry or occupation usually increases the magnitude of certain kinds of personnel problems over what they would be if high ratios for men prevailed. However, the application of this hypothesis in the collection of data to measure its effects or in the formulation of broadly conceived programs which cater

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dividual's basic way of thinking about causal relationships.

We hope that this brief review of some of the methodological and inferential problems encountered in epidemiological studies will stimulate further discussion. There exists a compelling need for establishing some general principles which would provide a logical framework for future investigators.

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CDC Course in Epidemiology for Nurses

A refresher course for nurses in communicable disease control will be given by the Communicable Disease Center, Public Health Service, Atlanta, Ga., from April 8 through April 26, 1957. The course is open to public health nurses and educational directors, industrial nurses, and instructors and consultants in nursing.

Designed to increase nurses' technical knowledge and skills in the prevention and control of communicable diseases, the course will stress epidemiological principles and techniques.

Supervised practice in the field may be arranged for a limited number of students after the termination of the course.

Applications must be filed with the Communicable Disease Center by March 10, 1957. Information and application forms may be obtained from the director of public health nursing in a State health department or from the Chief, Nursing Section, Epidemiology Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street, NE., Atlanta, Ga.

**Table 1. Work experience of the civilian noninstitutional population, by age and sex,
United States, 1954**

| Age | Total population, in thousands | | Percent reporting any work, 1954 | | Percent workers reporting full- time work | | Percent workers reporting working 50-52 weeks | |
|------------------|-----------------------------------|---------|-------------------------------------|--------|---|--------|---|--------|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| Total..... | 54, 124 | 59, 528 | 85. 6 | 42. 8 | 89. 4 | 73. 2 | 66 | 38 |
| 14-17..... | 4, 533 | 4, 453 | 49. 8 | 33. 9 | 30. 5 | 31. 5 | 3 | 2 |
| 18-19..... | 1, 805 | 2, 120 | 81. 3 | 62. 6 | 70. 8 | 76. 6 | 27 | 24 |
| 20-24..... | 3, 620 | 5, 344 | 87. 2 | 57. 1 | 89. 7 | 85. 8 | 45 | 40 |
| 25-34..... | 11, 068 | 12, 212 | 97. 8 | 44. 8 | 95. 7 | 78. 0 | 73 | 40 |
| 35-44..... | 10, 759 | 11, 486 | 98. 4 | 50. 3 | 95. 5 | 74. 1 | 76 | 40 |
| 45-54..... | 9, 097 | 9, 389 | 97. 6 | 49. 4 | 95. 2 | 75. 2 | 76 | 45 |
| 55-59..... | 3, 752 | 3, 932 | 93. 3 | 39. 7 | 93. 8 | 72. 8 | 71 | 45 |
| 60-64..... | 3, 179 | 3, 355 | 86. 3 | 34. 7 | 89. 9 | 70. 8 | 67 | 45 |
| 65-69..... | 2, 522 | 2, 695 | 66. 9 | 22. 0 | 82. 1 | 57. 9 | 56 | 37 |
| 70 and over..... | 3, 790 | 4, 542 | 32. 0 | 8. 3 | 64. 8 | 54. 9 | 45 | 35 |

SOURCE: Reference 9b.

force (table 2). In 1952, in an average month, for every 100 men entering the labor force 169 women entered, and for every 100 men leaving the labor force 170 women left. If the youngest and oldest age groups are excluded, since they are less stable in their labor force attachments, the differences between men and women become much more pronounced. For instance, in the age group 25-44, which constitutes nearly half the total and may be considered to be the backbone of the labor force, for every 100 men entering the labor force in an average month, about 500 women will enter, and for every 100 men withdrawing in the same period, about 500 women can be expected to withdraw.

The size of the differences in both of these measures is great enough to identify distinct variations between men and women in average individual work patterns. On the whole, working women do not have the close and sustained relationship to the labor force that men have, though of course the internal variation of individual cases around each hypothetical average is probably large enough so that there is a great deal of overlap in work patterns.

Factors Affecting Working Patterns of Women

The reasons women differ from men in their degree of attachment to the labor force are not difficult to find, and they have been recognized since women began to assume some importance

in the labor force. Women respond to the demands of the feminine role first and to occupational roles second. Hence, to a greater extent than is true of men, external and nonoccupational factors are of primary importance in modifying the occupational behavior of women. This more general point will be considered later but, before doing so, an attempt will be made to measure the strength of some of the specific factors which are associated with low rates of labor force participation by women.

Marriage

Marriage is the first factor which tends to detach women from gainful activity in the labor market. While there has been a steady and progressive increase of married women in the labor force in recent years, marriage still brings about a larger volume of withdrawals of women, age by age, from what it would have been if the women had remained single (*Id.*). Differences in labor force participation between single women and childless ever-married women are large in every age group, and it even appears that the differences increase with advancing age (see chart). Possibly 1 out of 3 or 4 women at work when they are single will cease to work when they marry or will withdraw from the labor force later.

There is added significance to these differences when it is seen that the proportion of all single women in the general population declines

to the needs of women has lagged. This is an omission which might be profitably explored in view of the likelihood that shortages of health personnel are likely to remain critical.

In presenting this point of view, no cure for these problems is offered. They have complex and ramifying roots, and long-range solutions will undoubtedly be difficult to achieve. On the other hand, even partial clues which may suggest operations for relieving some of the pressures on personnel administrators now and in the near future may not be wholly unwelcome, and it is within this more restricted framework that the following data are presented. It is also recognized that the data are not new but it is hoped that by presenting them in a systematic and moderately comprehensive way, they may shed new light on an old problem.

The specific aims of this paper are (a) to analyze certain differences in working activities and in strength of attachments to the labor force between men and women, (b) to review certain characteristics of women which affect the probabilities that they will or will not participate in the labor force, and (c) to suggest possible steps for mitigating personnel problems in the health field. Such broadly based factual data are a necessary first step in placing this facet of the problem in its proper context and, in lieu of particular data from the health field, will provide clues as to the specific influence of the sex ratio on the size of the personnel problem. A quantitative review of the data may also help the administrator to decide whether or not the effect of the sex ratio is sufficiently great to indicate further pursuit of the problem.

Sex Differences in Work Behavior

For many decades, the proportion of women in the labor force has risen continuously (3, 4). On the other hand, many differences in attitudes toward gainful work and in actual work behavior between men and women still prevail and will probably continue to prevail in the foreseeable future. An obvious example pertains to the important differences in classes of occupations and industries which attract women as compared with those which attract men (1b, 5). Another significant difference refers to the variations in stability and dura-

tion of employment. Both men and women move about a good deal within the labor force, that is, from job to job and from occupation to occupation (6-8), but their patterns of withdrawal from and reentry into the labor force itself are less similar. Women clearly differ from men in that they manifest a much larger volume of both withdrawal and reentry.

Monthly sample studies of the labor force, conducted by the Bureau of the Census, have presented two lines of evidence for measuring sex differences in participation in the labor force: (a) the work experience of the civilian noninstitutional population in the year preceding the January of enumeration insofar as these experiences could be constructed through retrospective methods and (b) monthly labor force turnover rates (9a, 9b).

First, with respect to annual work patterns, if the experience of any "normal" year is examined, that is, any year not marked by economic upheaval or war, it will be found that, (a) of all persons reporting any work experience for the year, a sizably larger proportion of women than of men will report part-time rather than full-time work during the year and (b) of those persons reporting any work, a sizably smaller proportion of women than of men will have reported working a full year (50-52 weeks). In 1954, for example, in the civilian noninstitutional population, over one-quarter of the women (27 percent) reporting work during the year worked at part-time jobs, whereas about one-tenth (11 percent) of the men employed worked at part-time jobs. Although among all women working during the year, over one-third (38 percent) reported that they worked for the full year, 66 percent or nearly two-thirds of the men stated that they had worked for the full year. These and other comparisons of annual work experience by age may be found in table 1.

Second, closely linked to these annual work patterns are the variations in labor force entry and withdrawal rates between men and women, and it is probable that differences in the volume of these movements largely account for the annual work experience patterns observed above. In any given year or month, a larger absolute number of women can be expected both to enter and to leave the labor

shows that there is a small but consistent decrease in the proportion of married women in the labor force with increasing numbers of children ever born to them, and these differences hold for all age groups.

In all instances, the rates of participation in the labor force by women with children are lower than for married women without children. The differences are most marked in the younger age groups, and here they are even greater than the differences between married women without children and single women. On the other hand, there is a good rise in the rate among the married women with children (except for those with children under 6 years of age), with the advancing age of the mother. This suggests that many women tend to reenter the labor force as their children become old enough not to require the kind of care necessary in the preschool and early school years. It may be this kind of movement which is partly responsible for the large number of additions of women to the labor force observed above. In any event, it is obvious that both marriage and parenthood are potent forces operating on the female labor market and that they bulk large in explaining the constant personnel turnover among women.

Also highlighted by these data is the quantitative importance of noneconomic and nonoccupational factors in the determination of when and how long women will be employed in the labor force.

Practical Implications

Differences in working patterns between men and women and the underlying attitudes and values which determine them are relevant facts to an industry such as the health field, which is heavily dependent on women for the delivery of services and the performance of necessary functions. Greater personnel problems can be expected, primarily for the reason that maintenance of the size of personnel is, potentially at least, a greater problem among women than among men. The working patterns of women and their possible role in contributing to the problems of personnel through attrition in this field should be given some consideration unless specifically disproved as not applicable to this

industry or to particular occupations within it. To give such recognition may help to identify areas where inordinate amounts of resources and energies are being applied to only small segments of the total personnel problem. An example might be the ease of an agency becoming concerned with working conditions and job satisfactions to the virtual exclusion of other considerations, on the assumption that these internal factors are exclusively related to holding employees to their jobs. It is clear that intrinsically, these are legitimate and significant organizational goals but if they are linked solely to solving personnel problems, it is not evident that they will be wholly successful. Particular agencies probably gain certain competitive advantages through such programs, thereby enabling them to attract personnel from other agencies. This, however, is analogous to robbing Peter to pay Paul, and the net effect toward the solution of the larger problem is zero.

Within broad limits, data of this sort suggest the systematic exploration of programs of action which aim more directly at utilizing to a greater extent some of the lost womanpower which attends the marginal status of women in the labor market. For example, greater flexibility in planning workloads and in making allowances for part-time work could be instituted in many instances. When compatible with organizational goals, conscious and deliberate attention to the needs of women, considered within their framework of reference and the competing demands on them, could conceivably be implemented to induce some women to maintain their attachments to the field or to return to it. Even a small measure of success along these lines would ease or mitigate a situation which is critical at the present time.

Another overlapping possibility suggested by this analysis is to take advantage of an ongoing trend, namely, the increase of married women with older children in the labor force, and to give greater consideration to recruitment from these ranks. It is perhaps unrealistic to assume that women of this age category could or should be persuaded to train for some occupation with formal requirements. On the other hand, within the field at the present time, there are certain on-the-job training experiences for some categories of personnel, and undoubtedly there

Table 2. Average monthly entries and withdrawals from the civilian labor force, by age and sex, United States, 1952

(Numbers in thousands)

| Age | Average civilian labor force | | Average monthly additions to the civilian labor force | | | Average monthly withdrawals from the civilian labor force | | |
|-------------|------------------------------|--------|---|--------|----------------------|---|--------|----------------------|
| | Male | Female | Male | Female | Female to male ratio | Male | Female | Female to male ratio |
| Total | 13,454 | 19,513 | 1,188 | 2,005 | 1.69 | 1,177 | 1,996 | 1.70 |
| 14-19 | 2,896 | 1,996 | 560 | 397 | .71 | 480 | 359 | .75 |
| 20-24 | 3,338 | 2,504 | 90 | 210 | 2.33 | 136 | 217 | 1.60 |
| 25-44 | 20,530 | 8,758 | 151 | 801 | 5.32 | 156 | 792 | 5.08 |
| 45-64 | 14,276 | 5,668 | 203 | 509 | 2.51 | 210 | 528 | 2.51 |
| 65 and over | 2,415 | 590 | 181 | 85 | .46 | 195 | 100 | .51 |

Source: Reference 9a.

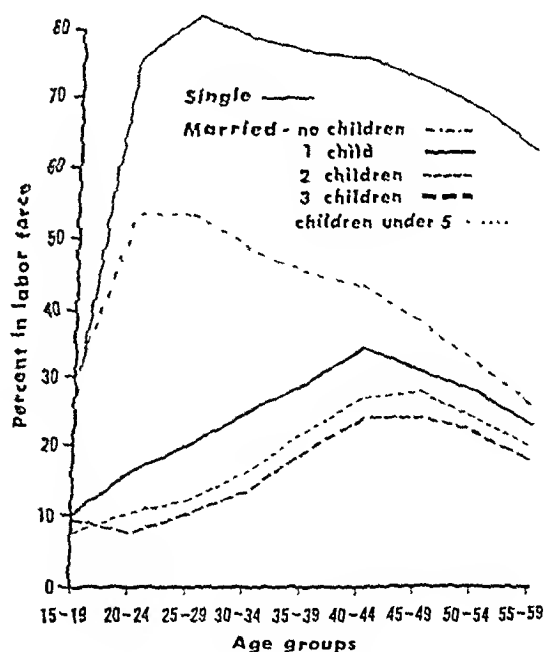
precipitously within a short space of about 7 or 8 years. It may be estimated from census data (*1c*) that of a cohort of young women of the same age, about one-quarter will have married by age 19; by age 21, one-half will have married; by age 24, three-quarters will have married; and by age 26, about 83 percent will have married. For the specific age groups from 18 through 22, it can be estimated that 9 to 13 percent within each age group will marry each year. In view of the preceding data, the probabilities are high that a sizable minority of those who do marry will quit the labor market or will not enter it. Assuming that one-quarter of those who marry do leave the labor market, this would give a rate of attrition of about 2 or 3 percent per year of all women in each of these age groups.

Children

The second factor associated with widespread withdrawals of women from the labor force, which is more significant than the fact of marriage alone, is the arrival of children (*1d*). The effects of these responsibilities are particularly noticeable during the children's early formative years when the needs for continuous care and guidance are greatest. It is at this point that the lowest rates of participation by married women in the labor force are observed. Not more than about 9 to 13 percent of the married white women in any group with children

under 5 years of age were classified as in the labor force in 1950 (see chart). In addition to the age of the children, the number of children that mothers have to care for has some effect on labor force participation. The chart also

Percentage of white women in the labor force: single women; married women, by number of children ever born; and married women with children under 5 years of age, United States, 1950. (Source: Reference 1d.)



clean air

Samples of four papers presented at the 49th annual meeting of the Air Pollution Control Association, May 20-24, 1956, Buffalo, are the following condensations of papers by Dr. F. W. Bowditch, Dr. August T. Rossano, Dr. Charles R. Williams, and Benjamin Linsky, president of the association.

Organized in 1907, the Air Pollution Control Association is the only national association devoted solely to air pollution control. Its membership represents widely diversified interests of industry, science, education, government, and the public.

Technical committees of the organization develop standards and reports and initiate research for industry. APCA publications keep members informed of new equipment, surveys, and research.

The *Journal of the Air Pollution Control Association* is published four times a year. Abstracts of current literature are published monthly. The yearly proceedings contain all the papers presented at the annual meeting.

Copies of individual technical papers can be obtained from Harry C. Ballman, executive secretary, Air Pollution Control Association, 4400 Fifth Avenue, Pittsburgh 13, Pa.

The Louisville Study

PHR To meet the need for rubber products in World War II, the Federal Government embarked on an intensive program of synthetic rubber production. A large plant for production of chemical rubber was built in an industrially zoned area on the southwest side of Louisville, Ky. Within a short time a dense network of plants producing rubber or its components sprang up. The area appropriately became known as Rubbertown, and shortly thereafter residents of the West End, an adjacent residential area, began complaining of odors, dust, and eye irritation.

By August T. Rossano, Jr., Sc.D., director of field studies, Community Air Pollution Program, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati.

This air pollution was generally attributed to operations in Rubbertown. Citizens' attempts at court action were unsuccessful.

History of Air Pollution Control

Louisville established a smoke commission which later became the Louisville Air Pollution Control Commission. After passage of a State enabling act, air pollution control became countywide with creation of the Jefferson County Air Pollution Control District in 1952.

Studies by the University of Louisville and the Battelle Memorial Institute attempted to determine the nature and source of air pollution in the West End. Their findings shed some light on the problem, but the results were not sufficiently conclusive to effect the desired abatement.

In July 1955, within a few days after Public Law 159 authorized the Public Health Service to establish a research and technical assistance

are many positions into which this age group could be fitted successfully. Moreover, there are many women, now inactive, who have been trained in skills in the health field. Nurses are an excellent example of such a group. It has been estimated that in 1951 the following proportions of nurses were active:

| <i>Age</i> | <i>Percent active</i> |
|------------------|-----------------------|
| Under 30..... | 53 |
| 30-39..... | 39 |
| 40-49..... | 35 |
| 50-59..... | 33 |
| 60 and over..... | 19 |

For all ages, about 45 percent of the nurses were estimated to be active (10). Until shown to be otherwise, it might be assumed that, given the appropriate conditions, many of these nurses could be induced to return to work in the health field. The same principle may also be applicable to other professional personnel.

Finally, one long-range solution which is suggested is the recruitment of men for ancillary positions in this field. The complexities of this approach are obvious, and in the short run chances of success are probably not great. This should not be allowed to obscure the possibility of change in the long run, however. It would seem that exploratory research and experiment in this area are indicated.

Summary

With the exception of physicians and dentists, the important professions and occupations in the health and medical care field are numerically dominated by women. This fact alone can be used to account for many of the personnel shortages in this field, when it is explicitly recognized that over a period of time the working patterns of women do not show the stability and continuity that are generally true for men. Because of marriage and childrearing, coupled with distinctive feminine attitudes toward work, large numbers of women tend to withdraw early from the labor force. This has the effect of creating many job vacancies where none would exist if the jobs were held by men and complicates the problem of personnel short-

ages already aggravated by general expansion in activity.

Certain practical steps may be taken to improve this situation. For example, greater attention to the needs and motivations of women and consideration of recruitment from the middle-aged group of women and from men are suggested.

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Stations 1 and 3 are the upwind and downwind stations $3\frac{1}{2}$ miles from Rubbertown.

Station 5 is on a line between Rubbertown and station 1 and collects data to indicate the influence of distance from the source.

Stations 4 and 6, flanking station 5, increase the chances of collecting polluted air originating in Rubbertown and provide information on the concentration gradient across the polluted air stream under prevailing wind conditions.

Station 2, also on the $3\frac{1}{2}$ -mile arc, collects typical samples of urban air not directly influenced by Rubbertown pollution under normal conditions.

In addition at least one fully equipped mobile station, built into a small truck, will supplement the fixed stations.

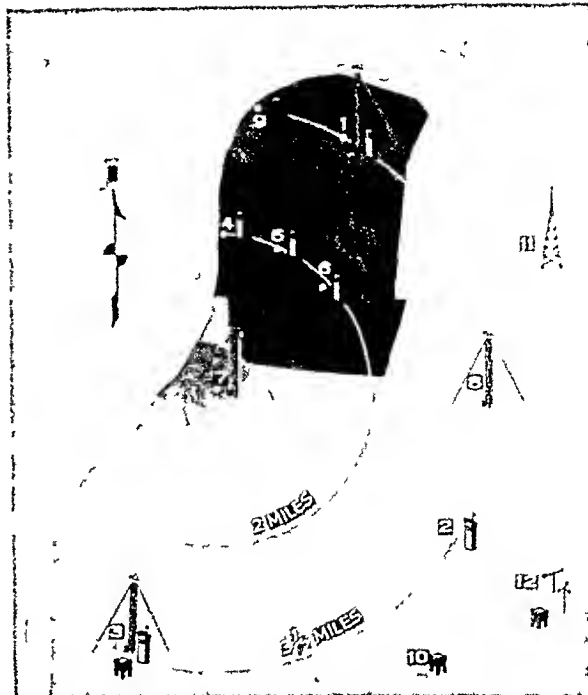
Two conventional high-volume samplers, using glass-fiber or cellulose filter paper, operate alternately at each site on an 8-hour cycle and collect 3 samples daily from each. An automatic timer controls the operation at night.

One innovation is a specially designed standard shelter. Another is having the principal axis of the high-volume sampler on a vertical rather than horizontal plane, thus minimizing any preferential effects.

Modified filter-tape samplers permit analysis of particulate matter by flame photometry. Dustfall containers and adhesive surfaces are likewise provided. Collected material is subjected to special morphological examination.

The analysis of particulates collected by the high-volume samplers consists of determination of total loading and organic and inorganic fractions. Chlorides, sulfates, and nitrates are determined by wet chemical methods. Finally, an analysis for 19 cations is made by emission spectroscopy and flame photometry.

Nonspecific gas sampling on an intermittent basis includes evacuated glass, plastic, and stainless steel containers, and freeze-out traps that use liquid oxygen or nitrogen. Collected samples are analyzed in the mass spectrometer at the National Bureau of Standards. Specific gases are sampled by conventional scrubbers, absorbers, impingers, and evacuated flasks. Continuous gas sampling is presently confined to an SO_2 recorder, to be supplemented later by other SO_2 units and other automatic sampler-analyzer equipment. Under development are



Air sampling and meteorological stations, Louisville, Ky.

continuous gas-sampling techniques utilizing compression cylinders, resin and activated carbon adsorption, and gas chromatography.

Meteorological Network

Considerable effort is being devoted to operation of a comprehensive meteorological network, planned, serviced, and analyzed by Weather Bureau personnel assigned to the Sanitary Engineering Center of the Public Health Service and to Louisville. Two of the four main meteorological stations coincide with stations 1 and 3 of the sampling network.

The equipment at each station consists of a 61-foot aluminum and steel tower supporting a wind vane and anemometer wired at the tower base to continuous recorders. Each station has a recording hygrothermograph and wet-bulb and dry-bulb thermometers housed in standard shelters. Other hygrothermograph recorders are situated high on the south side and in the extreme northwest of the city.

Meteorological instruments installed on a television tower include a wind vane at 525 feet, thermohms at 50, 170, and 524 feet, and continuous recorders at the base. Tower instru-

program in air pollution, the Jefferson County Air Pollution Control District requested the Service to assist with a study of pollution in the West End. The interested agencies agreed to the Service's proposal for a joint Federal, State, and local study.

The study was formally initiated in January 1956. The schedule calls for 6 months of preparation for full-scale operation, 1 year of detailed study and observation, and 3 to 6 months to evaluate and report findings. The broad objectives are to augment existing knowledge of the nature, extent, and sources of the problem as a basis for rational control.

Memorandum of Agreement

The memorandum of agreement sets forth the conditions of the study. The Air Pollution Control District of Jefferson County, the Louisville and Jefferson County Board of Health, the Kentucky Department of Health, and the Community Air Pollution Program of the Public Health Service are the cooperating agencies.

A steering committee, consisting of a representative from each agency, assists the technical director in nontechnical matters. The director serves as executive secretary of the committee and presents monthly progress reports to it. The release of nontechnical information is by unanimous approval of the committee. Final reports will be issued jointly by the cooperating agencies.

The budget is approximately \$175,000 a year. The local contribution is largely in funds with which to procure additional personnel, equipment, supplies, and services. Industry has subscribed approximately half of the local funds. The Federal contribution is in technical services and equipment. Local and Federal contributions are approximately equal.

Preliminary Operations

Personnel were recruited through personal communication and advertisements in technical journals and local newspapers. Employment of the non-Federal staff is by contract between the individual and the county control district. Responsibility for recruitment and selection rests with the technical director.

His staff consists of an engineer in charge, who is responsible for administrative, statistical, engineering, chemical, and meteorological services, and 13 full-time employees, who include personnel from the local board of health, Air Pollution Control Board, and the United States Weather Bureau. In addition, private and governmental consultants participate in the study. The chemical laboratories are provided by the State health department.

Plan of Study

The first objective of the study is determination of the quality of the air in and around the West End by analyses for various particulate and gaseous pollutants and for variations and fluctuations in their concentrations. Time and space considerations include diurnal, seasonal, and long-range trends and patterns and comparisons of pollutant concentrations on the basis of their horizontal and vertical distribution.

The second major objective is a study of the relation to air quality of meteorological and micrometeorological factors.

In approaching these two objectives four basic principles were adopted as guides to air sampling and meteorological observations. They are:

A comprehensive network of fixed observation stations covering the area of interest.

Measurements on a simultaneous and continuous basis 24 hours every day including weekends and holidays.

Sampling periods as short as practicable to obtain data suitable for estimating diurnal patterns.

Thorough analysis of selected samples.

Air Sampling

The air sampling network (see chart) is laid out on concentric arcs 2 and $3\frac{1}{2}$ miles from Rubbertown. Most of the stations are between 10° and 50° azimuth to provide greater coverage for the West End area and take into account the prevailing wind direction from Rubbertown. Placing stations equally distant from the source eliminates the distance factor as a variable in comparisons of station results.

No community willingly accepts excessive visible automotive exhausts, undoubtedly because the point of exhaust is always less than 15 feet above the road. Usually, these objections are established in local or State traffic laws.

The Detroit Program

Detroit renewed its air pollution control program in 1947 with a new ordinance, new budget, and new staff. So comprehensive was the ordinance in its coverage that as early as 1948 violation notices were being written against smoky diesel trucks by air pollution inspectors using Ringelmann and Umbrascope scales.

The undesirable effects were primarily localized rather than areawide, in the categories of sky darkening, horizontal visibility interference, soiling of surfaces, and annoyance to human senses. The administrative methods used were politely worded violation notices, hearings on maintenance practices of truckers and bus operators to improve internal reporting and correction, and court enforcement.

Though these procedures were effective, difficulties were encountered. The air pollution inspectors, driving civilian cars, in civilian clothes, found it dangerous to stop smoky vehicles on expressways. The ordinance inadequately covered the heavy blue-white emissions from oil-burning jalopies and poorly fueled 2-cycle diesel engines. The automotive smoke problem became more apparent as other smoke problems were reduced.

Industry-City Effort

The Smoke Abatement Bureau of Detroit explored better ways of control. It was decided by the several departments involved that the motor vehicle code should be the basis for effective legal control and that the police would do the job of surveillance, patrolling, and field enforcement with assistance from the bureau.

Accordingly, an ordinance amending the code was drafted, cleared with the city, and introduced by the common council. It was read twice, ordered published, and laid on the table. Then things began to happen.

Engine makers, fleet operators, and bus and

Urban Effects

Linsky has classified eight undesirable community effects, areawide or localized, of air pollutants on level terrain, according to the following categories:

- Sky darkening.
 - Horizontal visibility interference.
 - Soiling of surfaces.
 - Vegetation damage.
 - Other property damage.
 - Interference with production or services.
 - Annoyance to human senses.
 - Direct damage to health.
-

truck makers and their organizations met with each other and with the smoke abatement bureau, police department, and corporation counsel. Truck fleet operators and engine salesmen explained to each other how excessive smoke could be avoided. The Automobile Manufacturers Association offered to work with the smoke abatement bureau to develop the best possible program in the hometown of the automobile industry.

The AMA's offer was accepted with a time limit for accomplishment. On its expiration a second time limit was set. Before it expired, the first portion of the project had been adopted by the council. How was this accomplished?

Steps Toward Agreement

First, the automotive industry, truckers, bus fleet operators, and city representatives talked out the problem. Together they observed cars, buses, and trucks at selected intersections. This established a uniform viewpoint and "equalized the ignorance." At this point the dramatic difference in the effects when different grades of diesel fuel oil were used in identical 2-cycle engine diesel buses belonging to different fleet operators was fully recognized.

The smoke abatement bureau assigned a supervising engineer to work with the AMA committee. Periodic meetings of the committee were held with legal advisers and the author to assure parallel viewpoints.

Meanwhile, a national bus company switched to use of a higher priced grade of diesel oil.

mentation will permit vertical soundings of the atmosphere for measuring its stability. Wire-sonde observations are made periodically with mobile meteorological equipment.

Source Inventory and Other Studies

The third phase is an inventory of air pollution sources in Rubbertown to learn the nature and rate of industrial discharges and develop a basis for regulatory measures. Preliminary studies are made of plant processes, materials, mechanical equipment, waste products, and points of emission. Detailed stack sampling operations are being carried out with the assistance of the Bureau of Mines and the Public Health Service to determine the amount and chemical composition of solid and gaseous wastes. In addition, size, shape, and surface area of emitted aerosols are determined. Tracer studies will determine the range and influence of selected point sources.

Another major phase is a survey of the nature and origin of objectionable odors in the West End. The procedure includes study of industrial operations and collection and cataloging of samples of odorous material. Staff personnel use odor reference kits during routine surveys and intense fumigations. The Sanitary Engineering Center is developing an olfactometer for quantification of odors.

A pilot study in the West End will determine the nature, extent, and relative frequency of intense local fumigations resulting in objectionable odors, excessive dust, or related discomforts. This undertaking depends largely on the cooperation of trained volunteer observers, who report monthly on their daily records of odor, dust, or irritating pollution incidents. This activity provides both a means for determining the type, location, and frequency of annoying fumigations and a way of alerting emergency crews to peak levels of pollution.

Early in the planning, a working relationship was established with the analytical statistics group of the Sanitary Engineering Center to handle the voluminous data anticipated. In addition to consultation in the design of the survey, the center assists project analysts in the reduction, analysis, and interpretation of data.

This air pollution investigation gives full cognizance to the importance of adequate public information. The public is given a clear understanding of the scope and general approach of the study, the participating organizations and staff, and the amount and variety of technical work required and is apprised of developments by successive news releases. The ultimate aim is favorable public opinion so that the findings and conclusions will be of maximum use.

Automotive Vehicle Fumes

PHR The automotive exhaust problem receiving the greatest attention since the tetraethyl lead scare of the 1920's relates to the areawide smog effects recognized frequently in Los Angeles and far less frequently in other metropolitan areas. The vegetation damage, rubber cracking, eye irritation, and visibility interference noted in Los Angeles are now generally attributed to invisible hydrocarbons and oxides of nitrogen in large part from automotive exhausts.

But the greatest private attention given air pollution from automotive exhausts relates to the localized effects that are recognized daily everywhere in the civilized world. The effects are annoyance to the senses because of odor, visibility interference from the plume, sky darkening by the plume, soiling of surfaces, and toxic effects of some of the gases in confined spaces and high traffic concentrations.

Automotive exhausts include, in addition to the invisible hydrocarbons and oxides of nitrogen, a variety of gases and solid and liquid particles such as invisible carbon monoxide, invisible aldehydes, other invisible nitrogen compounds, visible carbon, visible hydrocarbons, and other complex petrochemicals, invisible water vapor, visible water droplets, and metallic compounds.

By Benjamin Linsky, M.S.E., P.E., at the time of the conference, chief smoke inspector, Detroit Bureau of Smoke Inspection and Abatement, and now, control officer, San Francisco Bay Area Air Pollution Control District.

When Detroit sought some means of dealing with vehicles emitting unnecessary amounts of smoke, the AMA offered technical, legal, and engineering assistance. The association proposed a joint research program with the Detroit Smoke Abatement Bureau as a basis for planning satisfactory enforcement.

The subcommittee assigned the technical aspects of the study to a Special Group on Exhaust Smoke, composed of engineering representatives of the major automobile, truck, and engine manufacturers.

Unnecessary visible emissions from gasoline-powered vehicles are usually caused by excessive oil consumption resulting from worn piston rings, cylinder liners, and valve guides. Similar emissions from diesel engines generally result from overfueling that may be caused by incorrect injector adjustment or burned injector tips, restrictions in the inlet air system, substandard fuel, overloading, cold operation, or mechanical deterioration of the engine.

It was readily established that specific legal definitions, such as the length or duration of the emission, have been unsatisfactory in apprehending excessive "smokers." All vehicles do not have the same exhaust problems. Observations of exhaust lengths and duration depend on numerous factors.

Discussions with smoke abatement and police officials, supplemented by street observations, indicated the need to train enforcing officers in recognizing unsatisfactory smoke conditions.

As a first step, the special group produced a training film. Each participating company took color motion pictures of emissions from different types of vehicles against various backgrounds. Because of the difficulty in obtaining shots on city streets, running vehicles on company proving grounds simulated actual smoking conditions. Films best approaching typical conditions were combined in a preliminary film. The final professional version was based on the favorable response of city and industry officials to the preliminary film.

The next step is the development of portable guide materials for enforcement officers. Members of the special group are taking color still shots, which will be thoroughly reviewed with city representatives and user groups. A concurrent study is seeking means to reproduce the

pictures in realistic permanent form. The final result will be a kit of simplified charts for identifying grades of smoke emission from automobile exhaust.

Industry lawyers have worked closely with the smoke abatement bureau and the city corporation counsel in rephrasing sections of the ordinance that will complement the training materials. Concentrated, cooperative effort should accomplish the desired result with a minimum of inconvenience to the driving public.

Fluoride Air Pollution



Because sufficient concentrations of fluorides in the atmosphere may damage living matter, it is inevitable that some parts of the United States are concerned about preventing losses of fluorides in manufacturing processes. Industries processing rock phosphate, fluor spar, and other ores of fluorine compounds are the main producers. Industrial consumers contribute their share to air pollution by fluorides.

It is relatively simple to identify an industrial source of fluorides when there is a single producer in the locality, because of the readily detectable biological effects in the neighborhood. The nature of the environment in which the producer is located will determine, to a large degree, the extent of pollution.

Air pollution by fluorides does not mean that these pollutants are not controllable nor that economic loss is not preventable. Economic loss results only if there is sufficient contaminant to do damage and if there is anything to be damaged.

Increased production of fluorides by industries has accompanied increases in production of fluoride byproducts. Further, when such industries move into areas with little experience in control of air pollution, the degree of con-

By Charles R. Williams, Ph.D., associate professor of applied industrial hygiene, Harvard School of Public Health, and director, industrial hygiene services, Liberty Mutual Insurance Co., Boston.

The municipally owned system had done this several years earlier.

The first result was the AMA production of a training film to show the difference between necessary and unnecessary visible emissions.

The ordinance was rewritten by the engineers and legal specialists of the AMA and the city.

The film and its narrative were reviewed by the police department and the industry-city team. The rephrased ordinance was then discussed and agreed upon with one modification that grew out of the practical experience of the police traffic administrator.

The industry-city team then presented the film and the final ordinance to the common council. The council was told that a color-printed pocket guide on visible emissions was in preparation and that its use might justify a change in the ordinance within a year.

The ordinance became effective in April 1956 with the support of trucking, cartage, and automobile club representatives.

The industry-city team showed the film to 300 police traffic safety officers and discussed the ordinance.

The deputy superintendent of police instructed police to give warnings for 60 days and then issue violation tickets.

The police commissioner directed the police department to keep a running count of "smoking vehicle" violations.

Arrangements were made for the industry-city team to present the film and discuss the ordinance with traffic court judges and referees.

The Revised Ordinance

In the original ordinance, the responsibility for smoke violations was placed solely on the operator and did not cover the unattended vehicle with its engine running and smoking. It read:

"No motor vehicle operator shall run his motor with cintent open or make any other unnecessary sound disturbance or operate a vehicle emitting from any source an unreasonable quantity of smoke, noxious gases, or vapor."

In the new ordinance, the owner, lessor, and driver are responsible because real responsibility does not always rest with the driver. Prob-

ably he should be solely responsible only when his "heavy foot" or "lazy gear shift hand" allows a diesel engine to lug at low engine speed. The new ordinance covers moving or stationary vehicles and adds the words "excessive," "unnecessary," and "obnoxious" to "unreasonable" in the original. It reads:

"No person, firm, or corporation shall operate or cause to be operated upon any street, highway, or other public place a motor vehicle, while stationary or moving, which emits from any source any unreasonable, excessive, or unnecessary smoke, obnoxious or noxious gases, or vapor."

"Unnecessary" was inserted to cover the heavy foot of the jackrabbit driver of a diesel vehicle, the use of a grade of diesel oil other than that specified by the engine maker, worn piston rings on a gasoline engine, and similar conditions.

"Excessive" was inserted primarily to cover the situation where a diesel engine is too low powered to handle the load with the gearset provided, with a resulting low engine speed, high torque, and shortage of combustion air.

"Obnoxious" was added to acknowledge that the odor of exhaust gases may be controlled through proper equipment design. Engineering advances make this practical, especially for 2-cycle diesel engines and the larger gasoline engines.

Automotive Industry Effort



Industry research by automotive manufacturers over the past years has helped reduce smoke emission from new motor vehicles. In recent years their interest has been formalized in the establishment of the Vehicle Combustion Products Subcommittee of the Automobile Manufacturers Association. This group has engaged in extensive cooperative research on exhaust emissions.

By F. H. Bowditch, Ph.D., chairman of the Special Group on Exhaust Smoke of the Automobile Manufacturers Association and senior research engineer at the General Motors Technical Center, Detroit.

size of the furnaces, on the operating procedures, and on the attempts to control the effluent.

One major approach is the installation of sprays and roof monitors to trap fluorides, but this solution has been unsatisfactory.

A second method is to provide local exhaust ventilation on each furnace and to remove the fluorides by passing the exhausted air through scrubbing towers. The effectiveness of recovery depends primarily on the kind of hood, the volume of air, and the type of scrubber.

Scrubbing systems are costly because of the large volume of air exhausted from large numbers of furnaces. In some plants, $2\frac{1}{2}$ to 3 million cubic feet of air a minute are exhausted and scrubbed.

Aluminum production depends primarily on availability of ore and cost of power. The plants of six producers are located in Arkansas, Alabama, Louisiana, Montana, North Carolina, New York, Oregon, Texas, and Washington.

To judge by damage claims resulting from injury to cattle and vegetation in the Pacific northwest, it is obvious that aluminum reduction plants cannot operate without controlling the fluoride effluent.

Evaluating Pollution Levels

It is almost impossible to set permissible levels for the amount of fluoride effluent. The severity of the problem depends on the amount of emission and its distribution. Distribution is affected by climate, wind direction, and terrain. Time is a factor because gaseous fluo-

rides may be retained and built up in vegetation.

Continuous sampling of vegetation is the most satisfactory way of evaluating fluoride pollution of the air. A grid system and periodic samples of different kinds of vegetation collected during the growing season best measure the effectiveness of control.

There are few valid criteria for fluorides in vegetation because of two complex factors. One relates to the amount of fluoride that will cause plant damage; the other to the amount that will produce injury in animals which consume the vegetation.

The levels that will damage vegetation vary with species over an extreme range. Fruit trees and some types of flowers are particularly susceptible to injury at low concentrations. Levels in grasses and animal feed that will injure cattle also vary with the condition of the cattle, fluoride intake from water and other sources, and time of exposure.

Extensive fluoride damage has cost industry millions of dollars. In many instances, the cost of claims has been staggering.

To avoid further economic loss, the dissemination of fluorides must be substantially reduced. Ventilation and collection should be installed when a plant is constructed. Vegetation levels should be kept below 30 p.p.m. to prevent damage to cattle.

With the extensive data available, it is obvious that no plant emitting large amounts of fluoride can afford to neglect the engineering necessary to atmospheric safety. The possibility that fluoride recovery may prove profitable, also, is only an added incentive.

Fluoridation Progress

Communities with a combined population of 6 million started fluoridating their water supplies in the first 9 months of 1956. The average annual increase for the past 5 years has been 4 million.

The latest tabulation by the Public Health Service shows that fluoridated drinking water is now supplied to one-fourth of the people using public water supplies. About 1,400 cities and towns with a population of over 30 million people were using fluoridated water at the end of September.

tamination tends to run ahead of control measures.

Phosphate Rock

Phosphate rock is used primarily for production of superphosphates (fertilizers), food and medicinal phosphates, elemental phosphorus, phosphoric acid, ferrophosphorus, and stock and poultry feed. It is also applied directly to the soil as fertilizer.

In Florida and the four western States of Idaho, Montana, Utah, and Wyoming, production has more than doubled since the war. In Tennessee, it has remained relatively stable. United States production increased from 5,399,739 long tons in 1945 to 12,031,213 in 1952.

In general, superphosphates are processed near the source of the ore, but availability and cost of power influences the location for manufacture of elemental phosphorus. Since Florida lacks sufficient power for phosphorus production, it uses most of its rock phosphate for fertilizer. Tennessee and the western States predominate in phosphorus production because of abundant power.

Rock phosphate, if it is high-grade ore, contains 2 to 3 percent fluorine. Fluorine is present in a fixed ratio to phosphorus, roughly 25 tons F in every 1,000 tons of rock processed. Wherever the rock is so processed that fluorophosphate is broken down, large quantities of fluorides can be released.

For every ton of rock processed, 40 to 60 lb. F may be released. A plant processing 1,000 tons a day can produce serious pollution if uncontrolled.

In the production of elemental phosphorus, the fluoride may be released in several processing steps. Because of the complexity of the operation, fluoride balance studies are needed to determine where losses in production actually occur. From an economic standpoint, it is wise to apply control measures only where they are really needed.

Some fluoride loss occurs in calcining or sintering the ore, depending on the temperatures used. Significant loss may occur in the electric furnaces, as fluorides escape into plant air and to the outdoor atmosphere. Other loss is in the off-gas, which in burning releases flu-

oride to the atmosphere. Substantial amounts of fluoride may be trapped in furnace slag and released as the slag cools.

In the production of superphosphate, the rock is treated with sulfuric acid with a resulting release of hydrogen fluoride and silicon tetrafluoride. The nature of the operation calls for its location in agricultural areas. Large tonnages of ore are handled, and, thus, large quantities of gaseous fluoride are released.

In the production of concentrated superphosphate, a new development in fertilizer manufacture, the release of fluorides is even greater. In some areas, damage has progressed from borderline to definite. This fertilizer is made by producing phosphoric acid from phosphate rock and treating additional rock with the acid.

Control efforts in each of two small areas, one in Florida and one in Tennessee, have been complicated by fluoride emissions from 10 to 12 plants producing superphosphate, phosphoric acid, animal and poultry feeds, and elemental phosphorus. With so many plants and their wide variations in manufacture, it is almost impossible to assess the blame for damage. Since the ultimate criterion is the total amount of fluoride emitted in an area, the permissible effluent from each plant must be reduced substantially.

Major Industrial Users

Fluorides used in the production of steel and aluminum are another large-scale source of pollution.

Though it is difficult to assess the proportions of fluorides released to the air, the steel industry is a major user of fluorspar, primarily as a flux in the manufacture of basic open hearth and basic electric steel. The industry used 53 percent of the fluorspar and 34 percent of the hydrofluoric acid consumed in 1952.

In the production of aluminum metal, the refined ore (alumina) is mixed with fluorides in electrolytic furnaces. The fluorides act as a flux and are released to the atmosphere as a result of decomposition under high temperature. They are carried upward by convection and, in the absence of local exhaust, are generally released through roof louvers. The amount escaping depends on the number and

Durability Tests Of Stainless Steel Hospital Utensils

By ARNOLD H. DODGE, B.S.

THE CIVILIAN HEALTH Requirements Program of the Public Health Service is seeking to determine whether hospital items made from non-nickel chrome steel (known usually as type 430 or type 17, containing about 17 percent chromium) are as durable as items made of the conventional chrome nickel stainless steel. Should the lack of nickel sufficiently impair the wearability of such items, it would be poor economy to deprive these items of that metal. The amount of nickel used in the hospital items is trivial when compared with total consumption. On the other hand, there is no point in continuing to use a strategic metal if such use is demonstrably extravagant and unnecessary. To determine whether or not nickel should be allocated to hospital items under a nickel control plan, it seemed desirable to obtain durability test information.

Stainless steel is essentially an alloy of iron and chromium. Nickel and other elements are often added to improve workability and to add corrosion resistance that will withstand special or unusually severe conditions.

For more than 20 years, certain articles of operating room furniture and hospital utensils in common use have been fabricated from a chrome nickel stainless steel, known usually as type 302 or 18-8 and containing about 18 percent chromium and 8 percent nickel. There has been a chronic countrywide shortage of nickel for most of this period. During World War II and the Korean emergency, supplies of nickel fell far short of demand, and controls were established to cover essential mili-

tary needs. Nickel has recently become more important to the national defense because of the wide application of this metal in the field of atomic energy and specialized military activities. Logically, it is mandatory that the use of nickel be restricted to essential commodities during periods of war. Whenever possible, however, nickel-free alternates to the products affected by conservation orders should still be useful for economic reasons.

Hospital Utensils

In February 1952, during the emergency in Korea, a meeting of an industry advisory committee of utensil manufacturers was held at the request of the National Production Authority (now the Business and Defense Services Administration). The agenda included, among other things, industry requests for assurance of a continued supply of chrome nickel stainless steel for the manufacture of hospital utensils and a discussion of the necessity for chrome nickel stainless steel in this class of items. If type 430 stainless steel is used exclusively, an estimated 10,000 pounds of nickel could be diverted annually to other purposes. Since no accurate or detailed information was known to be available about the durability of non-nickel stainless steel utensils, it was agreed to study selected utensils in use. The control authorities agreed that while the study proceeded manufacturers would continue to receive allocations of nickel-bearing stainless steel. Industry representatives offered to provide nickel-free utensils for the study. The Public Health Service agreed to oversee and arrange for tests in a hospital of six of each of the following utensils: bedpans, urinals, kickbuckets, and catheter trays with covers. Three of each were type 430 and three of each were type 302.

Through the cooperation of the American Hospital Association, arrangements were made to place the utensils in regular service at the Wesley Memorial Hospital in Chicago in September 1952. Basic instructions called for all test items to be kept in continual routine service and to be treated in the usual manner. Only supervisory personnel were aware of the test.

After 1 year of use, the utensils were forwarded to the office of Civilian Health Re-

Mr. Dodge is a senior pharmacist assigned to the Civilian Health Requirements Program, Office of the Surgeon General, Public Health Service. His paper is an interim report on a long-term study.

Device for Standardizing X-ray Techniques

A large plastic stepped wedge, which facilitates the coordination of research facilities, roentgen film, equipment and technical procedures, providing a high degree of uniformity in results, is being used by the Medical Investigations Branch, National Institute of Dental Research, Public Health Service. This is part of a broad-spectrum research program which embodies extensive roentgen procedures in keeping with the need for long-range human population group studies, correlating systematic conditions with dental problems.

A salient aspect of these studies is the repeated roentgenographic evaluation of individuals and population groups over a span of years. To assure uniform and valid results, roentgen procedures have been standardized as much as possible within the realm of practicality. This has been achieved to a fair degree with the help of Robert Morrison, medical division, and Dr. Herman E. Seeman, research laboratories of the Eastman Kodak Company, Rochester, N. Y.

Dr. Seeman, long interested in this type of problem, developed the plastic stepped wedge which meets the unique requirements of the study series.

The dimensions of the wedge are such that its thinner sections require the same exposure as thin patients and the thicker portions correspond similarly to heavy patients. In use, it is radiographed several times with a variety of techniques representative of those used for the normal range in patient size. The radiographs and data are filed for later reference. At some prescribed time, say a year later, the wedge is again radiographed, using the same nominal techniques. If the radiographs match those made the year before, it may be concluded that no significant change has occurred



in the equipment or materials used. If the radiographs do not match, the techniques or processing are modified until a match is obtained or film interpretations are made on the basis of the variation. In this manner, it is possible to maintain a given diagnostic film quality even with a variety of changes.

This must not be considered the final answer to highly technical or scientific activities requiring carefully standardized techniques but constitutes a tool, particularly adaptable to field use, that affords a large degree of uniformity in procedure and results. It is obvious that the stepped wedge should be composed of a substance similar to bone and soft tissue in terms of radiographic qualities. However, the more it approaches the realistic, the more complicated is its application to the problem. It is better to have a simple, practical procedure with some assurance that it will be applied than a

more refined one which will be neglected because of the need for interpreting exact measurements.

The device permits a practical degree of standardization for studies, film, developer, equipment, or technique changes. It serves to check on radiographic quality, demonstrating gradual deviation that might accrue through virtue of technique, processing, or photographic deterioration. More finite comparisons are permitted through the use of a densitometer, plotting a series of curves in relation to the respective circumstances.

An epidemiological roentgen study in itself is unique, and the standardized X-ray techniques, utilized to facilitate the studies, constitute an unusual approach to clinical research. The device itself is a practical approach to a number of common problems routinely encountered in radiographic installations where volume warrants its use.

quirements. With the exception of one type 430 urinal, all utensils were accounted for. These were inspected by representatives of interested Government agencies, including stainless steel and corrosion experts from the National Bureau of Standards, Armed Services Medical Procurement Agency, and the Business and Defense Services Administration of the Department of Commerce.

After a review of the findings, it was decided at a subsequent industry advisory committee meeting that the utensils should be tested further and that the testing institution should, preferably, be near the seashore so the effects of salt air on the utensils could be studied. The Department of Defense arranged for a controlled test at the Key West Naval Hospital in Florida.

The second test was completed and the utensils were returned to Washington for inspection by the same agencies. (One urinal and one kickbucket, both type 430, were misplaced and not returned from Key West). Results of the two tests appear on facing page.

Operating Room Furniture

In addition to the control on the use of nickel in utensils, the National Production Administration, early in 1951, had issued a restrictive order (NPA Order M-80) which prohibited the use of nickel steel in the manufacture of operating room furniture.

By a fortunate coincidence, purchase orders for equipment for the Clinical Center at the Public Health Service National Institutes of Health, then under construction, were being compiled. With this opportunity to test operating room furniture made from type 430 stainless steel, specifications were modified on a selected list of items. The following type 430 stainless steel items containing no nickel were among those obtained from the manufacturer:

- 1 linen hamper.
- 3 stands, irrigator (not placed in service).
- 1 stand, solution, single, Baker model.
- 1 stand, solution, double, Snyder model.
- 1 table, major operating pedestal, large.
- 2 stands, instrument, Mayo.
- 1 stool, anesthetist's, Bryson model.
- 2 stools, foot, 10' x 14' x 8'.
- 2 stools, revolving.

1 stool, foot, 12' x 30' x 4'.

2 tables, instrument, curved, 12' x 60' x 33' (not placed in service).

1 table, utility, 16' x 20' x 33'.

1 table, utility, 16' x 20' x 30' (not placed in service).

The operating room furniture serving as controls has not been listed above because adequate control was afforded by the normal course of simultaneous purchases of type 302 duplicate chrome nickel items for the other Clinical Center operating rooms. The operating room furniture was placed in general service in July 1953 at the Clinical Center. After 1 year of use it was inspected by the Sanitary Engineering Branch of the Division of Research Services, National Institutes of Health, and was then returned to routine service for a second year. The operating room furniture was inspected at the end of the second year by the National Bureau of Standards as well as the Sanitary Engineering Branch.

Detailed reports on individual items of operating room furniture for the first year were not received. However, all furniture pieces fabricated from type 430 stainless steel compared favorably with the type 302 items, except for surface scratches. Both types of furniture were kept in continual and equal service, and all surfaces were kept scrupulously clean. No significant signs of rust, pitting, or staining were reported at the end of 1 year. Detailed results of the second year tests follow.

Continuation of Tests

Upon completion of the second year of testing and inspection, the interested agencies agreed that periodical examination of the equipment should be continued indefinitely. Preferably, this additional testing would continue until failure of each item.

In addition to the continuation of the tests at the Clinical Center, the Bureau of Medical Services of the Public Health Service provided another site for the utensil testing, the Public Health Service Hospital in Baltimore, Md. By the use of a "quarterly inventory-annual report" system, followup information is expected to be current. Due to the long period which may be required, each utensil was engraved "on

Hospital Utensils

FIRST YEAR INSPECTION RESULTS

| Item | Type 302 (8 percent nickel) | Type 430 (no nickel) |
|--|--|---|
| Bedpans | Few scattered pits on inside bottom; slight discoloration; some corrosion and rust at weld line. | Many small scattered pits on inside; rust and pits at weld line; some discoloration. |
| Kickbuckets | Some discoloration; few light rust spots and pits on inside. | Moderate discoloration; rust spots and few deep pits on inside. |
| Urinals | Inside coated with deposit; spot welds on handle show rust; some rust and pits on inside walls and bottom inside; some staining. | Considerable rust inside at welds (handle); moderate staining or rust in neck and some pitting inside bottom. One had fabrication tear at pour lip. |
| Instrument trays with covers (8" x 2½" x 1½"). | Except for slight dulling and baked-on deposits of previous contents, no defects. | Same as type 302 plus slight rust on one cover inside. |

CONCLUSIONS: It was the consensus of those examining the utensils that there was a definite need for improved cleaning techniques. It was their opinion that proper cleaning should improve corrosion resistance of both types of stainless steel. Type 302 showed superiority in corrosion resistance. However, the usefulness of

type 430 utensils was not diminished because of the defects noted and there was no conclusive indication of early failure. One year of test proved insufficient to determine durability of type 430 stainless steel hospital utensils.

SECOND YEAR INSPECTION RESULTS

| | | |
|--|--|--|
| Bedpans | Few light rust stains on outside; some rust along weld on inside, also occasional rust spots on inside bottom and rolled head (hem). | Few rust spots and pits on outside and along weld; numerous rust spots mainly on inside weld seam and head. Scattered tiny pits on bottom. |
| Kickbuckets | Occasional discolored area on outside; few scattered rust stains, discolored areas, and etched spots on inside. One had several dark etched areas. Rust at a bail ear was observed on one. | Mottled and discolored on outside. One showed rust staining on outside bottom and mottled rust stains on a bail ear. One bucket, showing evidence of improper use, had four severe etched areas on curve of inside bottom; one area was perforated to the outside, making the bucket useless. Another bucket showed heavy etching on inside, with extensive discoloration to bottom third of bucket. Many etched and red rust spots and tiny pits were noted in discolored area. |
| Urinals | Occasional red rust stains at edge of rolled rim; superficial corrosion at handle welds; inside heavily discolored and coated with deposit; scattered rust spots on inside. | Rust on rolled rim; occasional rust spot and pits on outside. One had fabrication tear on pour lip. Heavy deposit on inside with discoloration pitting and rust spots on inside weld area. |
| Instrument trays with covers (8" x 2½" x 1½"). | Slight dulling of sheen on inside. | Occasional tiny pit and rust spot on inside. |

CONCLUSIONS: After examination by essentially the same group who inspected the items 1 year earlier, it was felt that only moderate changes in type 302 chrome-nickel stainless steel were noted. Aside from the perforated kickbucket, serviceability of utensils was not significantly diminished by the use of type 430 non-nickel stainless steel. It was again evident that proper

or complete cleaning was not accomplished and that this point must be emphasized to obtain the best service from all stainless steel utensils in hospitals. It was the opinion of the inspecting group that type 302 stainless steel showed superiority over the type 430, but additional testing should be pursued before final judgment.

The American Cancer Society

By THEODORE ADAMS

IT was in May 1913 that a small group of forward-looking physicians and laymen in New York City took the decisive step of forming the parent national organization of the American Cancer Society. They named it the American Society for the Control of Cancer. The \$10,000 contributed the first year was used to publish a pamphlet and promote discussions in women's clubs of a taboo subject—cancer.

In contrast to that small beginning, the Nation in 1956 contributed \$27,000,000 to the American Cancer Society's coordinated, countrywide program of public and professional education about cancer, service to patients, and scientific research into the cause and cure of this disease.

The American Cancer Society is a voluntary organization of people united to speed the conquest of cancer. It is composed of 60 chartered divisions serving the 48 States and Alaska through 2,788 organized units and more than a million volunteers. The divisions and units operate under volunteer directors, or governing committees, composed of lay and professional people who formulate policies and program objectives within the framework of national and divisional policies. Represented on the national board of the society are all areas of the country and business, industry, law, science, medicine, and communications. The society reports annually to the contributing public about funds collected and expenditures made. The president of the American Cancer Society is Dr. David A. Wood, director of the Cancer Research Institute and professor of pathology,

University of California. Chairman of the board is Walter J. Kohler, former Governor of Wisconsin.

Research

Research takes a big chunk out of the annual budget. This is natural, for the society believes, along with informed minds everywhere, that research is the key to the conquest of cancer. As a result, each year 25 percent of all funds received by the society have gone into its national research program. Since 1945, when this program was launched, almost \$50 million has been invested in grants for cancer research in the Nation's leading hospitals, universities, and other laboratories. Today, the work of a thousand senior scientists, assisted by some 3,000 younger workers, is backed by society funds. The investment has paid off by advancing fundamental knowledge of the life and growth processes, improved radiation and surgical techniques, and the development of lifesaving and pain-easing drugs, some of which can bring about temporary control of malignant growths.

The year 1956 also saw a dramatic reappraisal of the research program to speed developments and save lives. Approved by the board of directors were the basic recommendations of the society's Ad Hoc Research Policy Survey Committee for four types of grants for the support of research and four for the training and support of investigators. The philosophy behind the recommendations is embodied in the committee's report, which stresses continuity of research "to assure that the scientists now being trained are able to realize their maximum potential for fully imaginative and productive research, and to make a career in cancer research

Mr. Adams is director of the publications section of the American Cancer Society.

Operating Room Furniture

SECOND YEAR INSPECTION RESULTS

| Item | Type 302 (8 percent nickel) | Type 430 (no nickel) |
|--------------------------------|---|--|
| Utility tables, | A few scratches on surfaces. | Top scratched and discolored. Discoloration but no rust at welds. |
| Stools, revolving | No indications of rust. | Slight rust where ring welded to legs on one. |
| Operating tables | do | No indications of rust. |
| Solution basin stands, single | do | Some discoloration at welds but no rust stains. |
| Solution basin stands, double. | do | No indications of rust. |
| Stands, Mayo type | do | Do. |
| Stools, dentist's | do | Do. |
| Stools, foot | Slight rust stains at junction of lines with seat and at welds on legs. | Definite rust at junction of lines with seat and at welds on legs. |
| Linum hamper racks | Few scratches; clean welds. | No indications of rust; clean welds. |

CONCLUSIONS: The summary judgment reached by those examining the items was that type 302 articles are in slightly better condition than type 430. The difference, however, is not significant at this time. The evidence of excellent cleaning was apparent for all items

inspected. An interim judgment would suggest that hospital operating room furniture fabricated from type 430 chrome stainless steel would be sufficiently durable to serve as a satisfactory alternate for type 302 chrome nickel stainless steel.

test" and assigned an arbitrary number for positive long-term identification. Information as to failure or significant signs of early failure will be forwarded to mobilization planning agencies at appropriate intervals.

The marked evidence that routine cleaning methods of the utensils was inadequate obviously indicates that more information on the care of stainless steel should be disseminated. In this regard, through the efforts of the National Research Council and of the American Iron and Steel Institute, the preparation of a comprehensive booklet covering the care of stainless steel is being considered. Hospital administrators and others concerned with extending the life and maintaining the appearance of

stainless steel utensils and fixtures will find such a booklet very practical.

Summary

After 2 years of service testing of hospital utensils and operating room furniture, there is evidence that nickel-bearing stainless steel, with its corrosion resistance characteristics, is superior to non-nickel stainless steel. The margin of superiority noted, however, was not conspicuous in the furniture. With the exception of one kickbucket, deterioration was generally not severe or of a nature to destroy the usefulness of the article. Only minor instances of deterioration were observed in the non-nickel stainless steel operating room furniture.

Professional Nurse Traineeship Program

In a new program enacted by Congress on July 23, 1956, the Public Health Service is providing traineeships to assist graduate nurses in furthering their professional education.

For the academic year 1956-57, 553 traineeships totaling nearly \$2 million have been awarded under the new law (P. L. 911, Title II) to 56 schools of nursing and schools of public health throughout the United States and in Puerto Rico.

Mary O. Jenney, a Public Health Service officer since 1942, is in charge of the new program. She had been with the Division of Hospitals since 1947.

standing committee of the national board, of a Public Education Committee under the chairmanship of Dr. Frank M. Stanton, president of the Columbia Broadcasting System.

On the State and local level, the society's divisions and units work in cooperation with other national organizations, thereby reinforcing divisional public education activities. In 1955 the American Cancer Society worked with the American Public Health Association, the Industrial Medical Association, the National Science Teachers Association, the National Conference for Cooperation in Health Education, AFL-CIO, the Women's Auxiliary of the American Medical Association, the General Federation of Women's Clubs, and many others.

A recent public opinion poll has shown excellent results from the American Cancer Society's education program, although groups of low income and of lesser educational advantage still need much attention.

A major objective of the society's professional education program is to alert physicians everywhere to the possibility of cancer in all patients and to provide them with information that will aid its detection in an early, curable stage. A second objective is to improve the means for the diagnosis and effective treatment of cancer through special training given individual physicians. Closely related are the society's medical service activities, which provide needed medical laboratory services, equipment, and forms of organization designed to assure accurate case records and consultation between physicians on treatment and followup procedures. Close cooperation with State and local medical societies and hospitals is the rule. Grants are made to institutions approved for postgraduate training by the American Medical Association's Council on Medical Education and Hospitals, the institutions themselves designating the individual fellows. Thus, physicians completing their fellowships enter or return to practice with invaluable direct experience in basic medical problems of cancer.

Since the start of this program in 1948, a total of 864 fellowships has been awarded to 56 institutions. In addition, since 1950 grants of the society have contributed each year to the advanced training in cancer for physicians at the Memorial Cancer Center, New York City,

where 122 fellowships were awarded for the 1955-56 academic year alone. Since its inception in 1948 a total of \$2,493,690 has been devoted to this program.

The society publishes two bimonthly periodicals: *Cancer*, a scholarly journal for the clinical investigator, and *CA: A Bulletin of Cancer Progress* for the practitioner. The society's medical library prepares special bibliographies on cancer and issues to medical schools and libraries *Cancer Current Literature*, a monthly index. Other activities of the society for the benefit of the medical profession include a cancer monograph series, demonstration slides, medical exhibits, and special films.

Service

Units in most divisions of the society are organized on a county basis. Since much of the society's work is medical in character, local medical societies, hospitals, and departments of health are broadly represented on unit boards. In addition to basic community education and campaign activities, many of the units participate in hospital diagnostic and consultative services, cancer registries, cancer detection programs, lung cancer screening programs, nursing service, medical social work, and transportation of patients.

In 1955, 2,590 cancer information centers for the public were maintained by units, 410 of them on a full-time basis. Financial support was given to 387 hospital diagnostic and treatment services. Subsidies to visiting nurses' organizations made possible 202,103 visits to needy cancer patients.

Approximately one-third of the society's volunteers are engaged in service activities for cancer patients and their families. Almost 200,000 volunteers made 19,110,380 cancer dressings, which were distributed free to cancer patients. Unit loan closets, equipped with sick-room necessities, were supplied free to 20,754 patients.

Liaison With NCI

The society maintains continuous liaison with the National Cancer Institute of the Public Health Service. Working together, the two

so attractive as to lure the more capable and ingenious of the potential candidates."

Culminating a year's study by top-level scientists and administrators, the action was designed to meet more adequately the needs of the present advanced status of research by:

1. Establishing new types of research grants to individuals and institutions that will permit longer range planning and more flexible use of funds so that promising new leads may be pursued more rapidly.

2. Assuring more adequate manpower for cancer research by expanding the program of training to young scientists and establishing long-term faculty level positions in universities to attract more scientists to the field of medical research and keep them in it.

3. Coordinating under one Scientific Advisory Council the society's entire research program, which had become divided into a number of more or less independent efforts during the organization's rapid 10-year growth.

Following up these developments, the society, in August 1956, named 15 of the Nation's leading scientists and research administrators as members of the newly formed Scientific Advisory Council of the American Cancer Society. The appointments were announced by Governor Kohler, who said, "We have asked these scientists to serve as the primary guiding force in blueprinting the direction that our research program will take. They have a tremendous responsibility, but also the challenging opportunity to devote their talents and vast experience towards the ultimate solution of the cancer problem. The board of directors is gratified that some of the best scientific brains in the country have been assembled for this all-out attempt to discover the causes of cancer and to evolve better methods of control and cure."

Action by the American Cancer Society board directs that the new Scientific Advisory Council examine continuously progress in cancer research. The council will survey what is being done by both governmental and privately financed groups and will determine which are the most promising of the unmet needs. Recommendations will then be made for appropriation of funds in whatever categories are indicated. The council will review the recommendations

ACS Scientific Advisory Council

The American Cancer Society Scientific Advisory Council consists of the following:

Dr. George W. Beadle, chairman, California Institute of Technology, Pasadena; Dr. Walter J. Burdette, St. Louis University, St. Louis, Mo.; Dr. Philip P. Cohen, University of Wisconsin, Madison; Dr. Howard J. Curtis, Brookhaven National Laboratory, Upton, Long Island, N. Y.; Dr. Harold F. Dorn, Public Health Service, Bethesda, Md.; Dr. Thomas Francis, Jr., University of Michigan, Ann Arbor.

Dr. Alfred Gellhorn, Columbia University, New York City; Dr. Eugene P. Pendergrass, University of Pennsylvania, Philadelphia; John M. Russell, the John and Mary R. Markle Foundation, New York City; Dr. George Sayers, Western Reserve University, Cleveland, Ohio; Dr. Howard E. Skipper, Southern Research Institute, Birmingham, Ala.; Dr. Edward L. Tatum, Stanford University, Palo Alto, Calif.; Dr. Arnold D. Welch, Yale University, New Haven, Conn.; Dr. Milton C. Winternitz, National Research Council (retired), Washington, D. C.; and Dr. Gordon Zubrod, Public Health Service, Bethesda, Md.

of special scientific advisory committees dealing with specific areas of responsibility such as the cause, pathogenesis and treatment of cancer, institutional research grants, and personnel for research. Special areas will also be covered. For example, continuation of the existing Research Advisory Committee on Lung Cancer was authorized.

Education

The public education program of the national society is enhanced by year-round programs in the divisions. The program is concerned with audiences and is projected under formal headings of mass media, employee education, club and organization, school and college, and neighborhood educational programs. In 1955 more than 60 million copies of the society's leaflet, "Seven Danger Signals," were distributed. The same year the society's work in public education was strengthened by the establishment, as a

Syphilis Morbidity Reporting by Private Physicians

By EUGENE E. TAYLOR, M.D., M.P.H., and JOHN J. WRIGHT, M.D., M.P.H.

THE PROCESS by which private physicians report cases of communicable disease has often been a source of concern to public health officials. These officials have feared that reports were incomplete and were an unreliable basis for attempts to measure a communicable disease problem.

Syphilis case reporting presents certain distinctive difficulties in addition to those characteristics of general communicable disease reporting. This paper will describe how a group of North Carolina physicians view this problem. These physicians were questioned about the extent to which they reported cases of syphilis, their reasons for reporting or not reporting, and their opinions on the proper use of case reports by health departments. The interviews were carried out in the course of a more comprehensive survey of public health problems in the management of syphilis by private physicians.

Syphilis case reports are needed by official health departments as an index of the extent of the syphilis problem and also as a basis for initiating specific preventive action—particularly contact investigation. At present many authorities believe that, because of the lowered

cost of treatment, an increasing proportion of patients with early syphilis are seeking treatment from private physicians rather than from free clinics sponsored by health departments (1). If this is true, organized syphilis control activities may become increasingly dependent on the accuracy and completeness of physicians' reports.

Collection of Data

Our data consist of what physicians said about their own practices, opinions, and attitudes. Systematic observations of their work were not done as part of this study. Our principal informants were 74 practicing physicians in 5 counties and 2 cities of central North Carolina. These physicians included all general practitioners and internists practicing in the 5 counties and in 1 city (25,000 population), excluding a few physicians from these areas who were interviewed during the pretesting of the interview schedule. The physicians from the other city (70,000 population) included all Negro general practitioners and internists and a sample constituting one-third of all white general practitioners and internists (exclusive of the full-time staff of a teaching hospital) chosen at random. Of the total of 74 physicians, 64 were general practitioners and 10 were internists; 59 were white and 15 were Negro. Four well-organized local health departments served the study area.

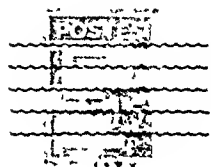
Pretesting interviews were carried out during the winter of 1951-52 with a separate group of 27 private physicians and 8 public health

Major Taylor, formerly instructor in public health administration, School of Public Health, University of North Carolina, Chapel Hill, is with the Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D. C. Dr. Wright is professor of public health administration, University of North Carolina School of Public Health.

organizations have sponsored national cancer conferences at which all aspects of the problem have been reviewed and new developments in research and therapy brought to public attention. The third National Cancer Conference was held in Detroit, June 4-6, 1956, and was attended, in addition to United States leaders in this field, by a distinguished contingent of cancer specialists representing 22 foreign countries. Also, to give all possible assistance when requested by proper authorities in foreign

countries, the American Cancer Society has in operation a board committee and foreign desk to maintain liaison with the Department of State and foreign embassies and to answer queries from abroad. More than 500 requests for information were received from 69 countries in 1955.

Thus the society, while pursuing its own threefold goal of research, education, and service, acts as a national and international catalyst to end the scourge of cancer.



INTERNATIONAL MAIL POUCH

Inoculation—Local Style

In remote sections of Afghanistan, which is larger than Texas, it has been the practice of "mullahs" to inoculate villagers with matter from pustules of patients with active smallpox. Many villagers bear scars on the dorsum of the hand between the first and second metacarpals as evidence of this practice. Near Lashkar Gah, one such mullah practicing his art left a wake of dead children, hand infections, and axillary abscesses, products of a combination of smallpox and septicemia. The Lashkar Gah staff saved many children, but the mullah escaped.

—LESLIE J. DEGROOT, M.D., *acting public health adviser, United States Operations Mission to Afghanistan.*

"Stamping" Out Malaria

The Government of India has issued a 6-anna postage stamp bearing the legend "malaria control" with two scenes: one depicts poverty in malarious areas, the other shows prosperity after DDT. With

a history of more than a million deaths annually from malaria, India is waging a large and successful control campaign.

—JOHN J. HANLON, M.D., *chief, Public Health Division, International Cooperation Administration.*

Rural Health Teams

Extension of rural health services in the Philippine Islands has reached the point where more than a third of the smallest governmental units have the basic team of physician, nurse, midwife, and sanitary inspector. Two-thirds have at least three of the team. More than 9 in 10 had at least one public health official. Training centers plan to provide field experience for more than 7,000 community development workers. Malaria control has progressed to the point where housewives question the need for further spraying of their walls since none of the family has had the fever for a year.

—MALCOLM J. FORD, M.D., *rural health adviser to the Republic of the Philippines.*

Table 2. Factors influencing physicians' decisions not to report or to report syphilis cases as a general rule or in individual instances

| Factors influencing decision | Number of physicians replying | Percent of 74 physicians |
|---|-------------------------------|--------------------------|
| <i>Not to report</i> | | |
| Fear that information about patient will not remain confidential | 29 | 39.2 |
| High status of patient or personal friendship of physician for patient | 10 | 13.5 |
| Hostility to "making reports" and "red tape"; indifference; "no reason" | 10 | 13.5 |
| Various clinical characteristics | 5 | 6.8 |
| Ability of patient to cooperate with physician | 2 | 2.7 |
| Miscellaneous | 5 | 6.8 |
| <i>To report</i> | | |
| Legal requirement to report | 20 | 27.1 |
| Recognition of health department's need for case reports in order to carry out control measures with individual patients and families | 19 | 25.7 |
| Recognition of health department's need for case reports for statistical studies | 11 | 14.9 |
| Inability of patient to cooperate with physician | 9 | 12.2 |
| Patient being referred to health department for treatment | 7 | 9.5 |
| Various clinical characteristics | 5 | 6.8 |
| Miscellaneous | 5 | 6.8 |

locked up and we have found evidence that the janitor and janitress have looked through records."

"A few prominent patients would be reported as 'X' rather than by name. This is because they know people who work in the health department. In a small town you have to consider this even though the clerk in the health department here is a very fine person."

"One of my patients had a blood test done which was negative. A friend of hers, who worked in the public health lab, told her, 'I saw your blood going through.' I figured this friend might tell if someone had a positive test, so I use numbers and don't report by name."

The patient's status was cited by 10 physicians (14 percent) as a factor influencing their reporting practices.

"If the patient was a friend or an outstanding person in the community I wouldn't report his name to the health department. No good would be accomplished by having it publicized."

Ten physicians mentioned the work involved

in reporting or said they simply neglected or forgot to report cases.

"I have no scruples against it. I just don't do it."

"It takes too much time and red tape. I know the statistical value and contact tracing value, but there is too much time required of the doctor and no compensation given."

Two physicians stated that cooperation on the part of the patient in following orders would influence them not to report while nine physicians stated the converse—that lack of cooperation would influence them to make a report. Case holding during therapy itself is no longer the problem it once was; however, adequate followup is still a long-term process which does require understanding and cooperation by the patient.

Certain clinical characteristics of individual patients were named as reasons for "not reporting" by five physicians. These were "old cases," "partially treated cases," "cases with a 'doubtful' blood test," and "noninfectious cases." Other clinical characteristics were named by five physicians as reasons "for reporting." These were "prenatal patients," "infectious cases," and "seroresistant cases." In general, the first group of characteristics suggests less urgent need for action on the part of the health department than does the second group of characteristics. This is an encouraging finding; however, it would not be justifiable, on the basis of these data alone, to conclude that all or even most of the cases regarding which the health department should take action would be selected by the physician for reporting.

In general, the interviewer gained a distinct impression that physicians were uncertain about how to answer the question: "Why do you report?" Lack of cooperation by the patient and the clinical characteristics of the case have been mentioned. The most frequent answers were that reporting was required by law, that reports were needed for control measures centered around the individual case (for example, contact investigation and followup), and that reports were needed for statistical studies (table 2). But to the interviewer, the answers seemed vague, and few concrete examples were given from the doctor's own experience.

physicians from the same general area. The 74 standardized interviews were carried out in April and May 1952.

In the analysis of data, physicians' answers were grouped together in appropriate categories. Sometimes more than one answer would be given to a question, the informant indicating alternative actions he might take under various circumstances. Therefore, percentages of physicians giving various types of answers may add to more than 100 percent. During both pretest and standardized interviews, many of the comments by physicians were written down verbatim. Examples will be given to illustrate the kinds of individual response grouped into particular categories.

Response by Physicians

Physicians were asked whether they would report their syphilis cases by name to the health department. Answers were immediately classified by the interviewer according to a scale, as shown in table 1. Over one-third of the physicians claimed to report all cases, while less than one-tenth of the group asserted they never reported a case. On the other hand, two-thirds admitted failure to report at least some cases. The most important fact emerging from table 1 is that it tends to confirm the presence of a real problem centered in the reporting process.

Reporting Practices

Depending on their initial answer, physicians were asked alternative questions as to why they did or did not report syphilis cases. Answers to these questions are summarized in table 2. Doubts as to the confidentiality of reports and the closely related factor of patient status were the outstanding reason for "not reporting" cases, followed by indifference or hostility to the administrative paper work required. Outstanding among reasons "for reporting" cases were an awareness that "it's the law," plus recognition of the value of case reports to the health department (a) for carrying out specific control activities or (b) for statistical studies.

Twenty-nine, or about 40 percent, of the physicians expressed concern that the identity of their patients would not remain secret and that patients would suffer as a consequence.

Table 1. Physicians' answers to question: "When you find that a patient has syphilis do you report his name to the health department?"

| Reply | Physicians replying | |
|--|---------------------|---------|
| | Number | Percent |
| Report all cases | 26 | 35.2 |
| Generally report, sometimes do not report | 17 | 23.0 |
| No general policy or tendency | 6 | 8.1 |
| Generally do not report, sometimes do report | 19 | 25.7 |
| Never report a case | 6 | 8.1 |
| Total | 75 | 100.1 |

Reasons given by individual physicians for this fear included:

1. Chances of improper disclosure multiply as each additional person has legitimate access to information.
2. Health department clerks are not adequately trained in medical ethics.
3. Health department offices sometimes are not physically adequate for protection of confidential information.
4. Though the health department employee may keep information confidential, his own knowledge may harm the patient indirectly, particularly in small towns and rural areas.
5. Specific incidents, not necessarily involving a case of syphilis or even the health department, have impressed the physician with the speed of travel of gossip and rumor.

The following statements illustrate these points of view:

"Most people don't want everyone knowing they have syphilis. When three people know anything, it's out."

"I'm sure that the nurses and other trained persons at the health department keep things confidential. But the clerk is hired right here in town and has had no particular training. She might not keep things confidential."

A health officer interviewed during pretesting of the interview schedule: "Often the physical facilities are such in health departments that information cannot be kept confidential. . . . In my own health department, I share an office with five other persons. Sometimes it has been impossible to have records

initiated on the request of the private physician. However, 30 percent were uncertain, and 12 percent thought that the health department took independent action when a case report was made. Of the latter group of 9 physicians, 5 rarely or never reported cases; 1 usually reported his cases but was opposed to the health department's initiation of any control measures on the basis of the reports, and 3 physicians said they reported all cases and felt that the health department should proceed on its own initiative with contact investigation.

If a health department is to carry out control measures related to the private patient on whom a report of syphilis is made and yet is not going to bypass the physician, a basic action is to initiate discussion of the case with the physician. Health department and physician together must arrive at some working arrangement as to what is to be done, and by whom. A logical extension of this type of health department action is to contact the private physician who has submitted to the laboratory a blood sample which is positive to a serologic test for syphilis (STS)—if a case report is not received in 2 or 3 weeks. (To make this procedure practicable, a central file must first be checked to eliminate previously reported cases.) If the diagnosis is complete, assistance can be offered to the physician and a case report can be made immediately. If the health department laboratory performs most of the STS for the area, the completeness of case reporting and the extent

of use of health department control services should increase markedly.

At the time of the survey, none of the four health departments in the study area were carrying out the policy described. Since other areas of the country had reported success with such a policy (2), we endeavored to find out whether or not our informants would view it with favor. The answers of the 74 informants to this question are shown in table 5.

Table 5 suggests that the physicians were more favorable toward this specific type of health department action than toward the general idea of control activities directed at their syphilitic patients. Fifty-seven percent indicated they were in favor of the policy outlined, 26 percent were opposed to it, and 18 percent made comments that could not be definitely classified as favorable or unfavorable.

Interesting arguments were given for and against the hypothetical policy. Some physicians felt such a policy would be of definite help to them in clinical management and in preventing patients from being lost to medical observation:

"This would be an excellent policy because we lose patients. My partner and I see 70 to 80 patients a day. When we get through the day we don't have time to trace people down. I write the patients letters and they ignore them. The public health nurses could get out and run them down."

"This policy would leave no loopholes. It would make sure the doctor gets the blood test report. It would find whether or not the health department can be of help. It would save the doctor time. This is a factor in general practice."

Other physicians felt that the hypothetical policy would be unnecessary and expensive:

"It would be all right. But I feel the measures already being done are handling the problem pretty well. I used to find 15 percent positive tests, and only about 1 percent now."

"It seems to me there would be a duplication of effort. Here we try to reduce the health department work to a minimum. I feel this policy would not be necessary."

Again, some doctors felt that initiation of discussion of the case by the health department would be an objectionable interference in the physician-patient relationship, some mentioned their dislike of having the government involved in their work, and some objected to the

Table 4. Physicians' answers to question: "In this county, does the health department usually contact the patient or his family directly when a doctor reports a case of syphilis?"

| Reply | Physicians | |
|--|------------|---------|
| | Number | Percent |
| No, health department does not usually contact patient or family directly..... | 42 | 56.8 |
| Not certain or do not know..... | 23 | 31.1 |
| Yes, health department usually does contact patient or family directly..... | 9 | 12.2 |
| Total..... | 74 | 100.1 |

"It's the law."

"The only reason I know for reporting is that public health has helped by taking over syphilis. There used to be many inadequately treated cases."

"I feel cases should be reported. I'm not sure why. I have just been led to that opinion by the health department."

Seven physicians mentioned that some cases would be reported merely as a part of the process of referring them to the health department for treatment. Finally, a variety of miscellaneous reasons were cited by a very few physicians each to explain why cases were or were not reported. A few are of possible importance though not mentioned frequently by our informants, for example:

"The reporting of infectious disease has been backsliding for years. It's silly to report measles and chickenpox. This attitude carries over to the reporting of syphilis. We report polio, typhoid, TB—but we don't report syphilis as well as we should."

As stated above, our informants recognized certain uses which a health department might make of case reports. Additional questions were asked to learn more about physicians' concepts of the role, actual and desirable, of the health department in control measures aimed at the private patient.

Health Department Control

Forty-nine physicians, excluding the 25 who never or only rarely make a case report by name, were asked: "In your opinion, should the health department take any action when a private doctor reports that one of his patients has syphilis?" The type of "action" which might be taken was purposely left unspecified. Answers are shown in table 3.

The majority of the physician informants had reservations about health department "action" (table 3). One-tenth said that the health department should take no action and mentioned no exception. About 40 percent said action should be taken only on the specific request of the private physician. And it is probably fair to say that the one-third who rarely or never report their cases would also be opposed to the health department taking any part in the management of their private patients. Finally, a minority of 10 (14 percent) informants voiced definite opinions that the health

department should take specific types of action—investigation of contacts, followup of patients to insure adequacy of treatment, or education of the patient.

A possible explanation for physicians' reluctance to have the health department carry out specific control measures with private patients is that the physicians are uninformed or misinformed as to what this action might be. For example, physicians have traditionally feared and opposed any third person working independently with their patients, thus possibly interfering in the physician-patient relationship.

Actually, according to the health officers, all four local health departments in the areas surveyed followed a policy of not making any contact with the patient or members of his family, except with the approval of the private physician. To study physicians' knowledge of this policy, all 74 informants were asked: "In this county, does the health department usually contact the patient or family directly when a doctor reports a case of syphilis?" Answers are summarized in table 4.

The majority (57 percent) thought, correctly, that the health department did not contact the patient or family directly, that any contact was

Table 3. Physicians' answers to question: "Should the health department take any action when a private doctor reports that one of his patients has syphilis?"

| Reply | Physicians | |
|---|------------|---------|
| | Number | Percent |
| Health department should take action | 10 | 13.5 |
| Investigate contacts | (6) | (8.1) |
| Check to see that patient completes treatment | (5) | (6.8) |
| Send patient educational literature | (1) | (1.4) |
| Health department should not take action unless specifically requested by private physician | 29 | 39.2 |
| Health department should not take action (no exceptions mentioned) | 8 | 10.8 |
| Other | 2 | 2.7 |
| Question not asked because physician rarely or never reports a case by name | 25 | 33.8 |
| Total | 74 | 100.0 |

initiated on the request of the private physician. However, 30 percent were uncertain, and 12 percent thought that the health department took independent action when a case report was made. Of the latter group of 9 physicians, 5 rarely or never reported cases; 1 usually reported his cases but was opposed to the health department's initiation of any control measures on the basis of the reports, and 3 physicians said they reported all cases and felt that the health department should proceed on its own initiative with contact investigation.

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Table 5. Physicians' answers to question: "Some health departments have the policy that whenever a doctor sends to the laboratory a blood sample that is STS positive, the health department contacts the doctor, discusses the case with him and offers assistance. What do you think about such a policy?"

| Reply | Physicians replying | |
|---------------|---------------------|---------|
| | Number | Percent |
| In favor..... | 12 | 56.8 |
| Opposed..... | 19 | 25.7 |
| Other..... | 13 | 17.6 |
| Total..... | 74 | 100.1 |

health department taking the initiative away from them:

"I think it would be a good thing but I just don't like government interference."

"I wouldn't like this. It's better to leave it up to the doctor. This policy takes the initiative away from the doctor—undermines his interest in the case. And as a general rule the doctor will take more personal interest than the health department will in the patient."

One internist who favored the policy in general thought it should not be applied too rigidly. If the health officer had confidence in a particular doctor, he could assume that that doctor would "carry through with what was needed." If another doctor had not shown too much interest in syphilis, it might be necessary for the health officer to "keep in pretty close touch with him."

In summary, tables 3-5 suggest that physicians were suspicious of the general idea of health department participation in patient management (table 3); however, at the time of the interviews, they generally did not feel that the health department was participating to an objectionable degree (table 4); and finally the majority were willing for the health department to participate to a greater degree by at least initiating inquiries of the physician based on positive STS reports (table 5).

Discussion

Many problems and issues arise in the process of obtaining and using syphilis case re-

ports. The data presented have bearing on several of these problems.

Completeness of Reporting

The first and most important problem pertains to completeness of reporting. We cannot make a numerical estimate of the completeness of reporting by our informants, but it appears reasonable to conclude that many cases were not being reported.

This general conclusion is in agreement with a number of studies from other areas and periods of time. Rack (3) studied a series of 436 cases of syphilis from the Eastern Health District of Baltimore discovered by private physicians during 1932-37 and found that only 71, or 16 percent, had been reported to the Baltimore City Health Department. The Report of the WHO Syphilis Study Commission (4) states that in the United States "reporting by private physicians is variable, and, from our information, appears to be low." Lentz and Beerman (5) in 1952 mailed a questionnaire to all physicians known to be in private practice in Philadelphia. Replies were received from 75 percent of the physicians, who indicated that in 1951 they had treated 3,112 cases of syphilis. During the same period, the Philadelphia Department of Public Health had received reports for only 753 cases—less than 25 percent of the total treated, even assuming that physicians not replying to the questionnaire had discovered no syphilis.

Judging from the information received from our informants, the most serious obstacle to complete reporting is the desire of patient and physician to keep the diagnosis of syphilis a secret. The stigma attached to venereal disease has probably decreased in recent years, but it is unlikely to disappear entirely. Apparently, the physician often feels he must choose between a risk to his patient which is concrete, obvious, and within the physician's experience and a possible value to the community which is vague at best.

Keeping Reports Confidential

Certain steps can be taken by a health department to insure that case reports remain confidential. Physical inadequacies which make records and files accessible to unauthor-

ized persons can be attacked directly. Clerical and other personnel can be given additional training and supervision in the handling of confidential records. If these accomplishments are brought to the attention of physicians, they may feel free to submit more complete reports.

But there are limits to how effective these measures can be. When the health department employee who receives a report of a case of syphilis is a personal acquaintance of the syphilitic patient, harm may have been done the patient even if information travels no farther. This will be a particular problem in rural areas and small towns. And despite all precautions, the length of the route of communication in the reporting process (doctor's office to local health department to State health department) allows many possibilities for information to be diverted into improper pathways.

High social status of the patient and his willingness to cooperate with the physician influence the latter's decision not to report a case of syphilis. These factors cannot be altered directly by health department action, except by the above measures and by any other action which gives the physician and his patient greater faith in the confidentiality of the reporting process.

Simplifying Reporting

Some informants complained about the "red tape" of the reporting process. It is true that somewhat more effort and specialized knowledge are required to complete the usual syphilis report form than to make a report of most of the other communicable diseases. Possibly the total volume of paper work required of the physician could be reduced by eliminating so-called compulsory, but probably very incomplete, reporting of some of the common communicable diseases, such as measles, for which there is no very effective control program in operation.

This would leave the physician with more time for, and possibly more interest in, the reporting of diseases, such as syphilis, which are more important from the standpoint of specific preventive action which can be taken by the health department. The American Public Health Association's manual, *Control of Communicable Diseases in Man* (6), has re-

cently reenphasized that: "Diseases are often made reportable although the information gathered is put to no practical use. This frequently has the result that the general level of reporting deteriorates, even for diseases of much importance. Better case reporting is usually to be had by restricting official reports to those diseases for which control services are provided, or potential control measures are under evaluation, or epidemiological information is needed for a definite purpose."

Reasons for Reporting

While our informants had quite substantial reasons for "not reporting" syphilis cases, their reasons "for reporting" seemed vague and unconvincing. The health department may be able to take steps which will increase physicians' positive motivation to report cases.

Despite the fact that all States require that syphilis be reported, the law is seldom enforced. Nor does it seem likely that attempts at real enforcement would be successful.

It may be possible to increase physicians' interest in contributing to good statistical data. We have no definite recommendations for accomplishing this. A means will have to be found to make syphilis morbidity data of more concrete interest and value at the local level. At present, if the physician does see the data he has contributed, it is usually in the form of consolidated figures for State or Nation. He may see local rates in his health department's annual report, but these also are not of dramatic interest, and they lack the respectability associated with large numbers.

Next to the legal requirement, the factor most frequently mentioned as influencing our informants to report cases of syphilis was an awareness that the health department needed the reports to carry out certain control measures with individual cases. A health department should make it clear to private physicians that, with rare exceptions, staff members do not attempt to carry out these measures without notifying and coordinating their efforts with the physician. This knowledge should help the physician who fails to report a case because he fears the health department will harass the patient. Also it will be of interest to the occasional physician who expects and wants the

health department to go ahead routinely with such procedures as contact investigation and followup when he makes a case report. He should know that if he wants these procedures done he must specifically request them.

Use of Laboratory Records

Despite all the various measures which can be suggested to improve reporting, it seems unlikely that complete reporting can be achieved on a voluntary basis. Reporting can be made a more nearly compulsory procedure if the health department has access to a large part of the reports of STS done in the area, and if it uses these as the basis for case reports. For this procedure to be completely successful, the health department laboratory must perform most of the STS done in the area, or there must be a voluntary arrangement giving the health department laboratory access to positive STS reports from private laboratories. A recent Public Health Service manual gives a clear outline of the details of this reporting system (7).

The majority of our informants were in favor of the laboratory records of positive STS being used in this way (table 5). The health department carrying out such a policy must decide how much time and effort can be devoted to it. The work can be kept to a minimum. Report cards can simply be mailed to a physician for each patient on whom a positive STS report is received and for whom no case report is on file. Or a great deal of effort can be expended. Physicians can be telephoned, and a case report can be made out at that time, making it convenient for them to request information about clinical problems or help in followup and contact investigation. As suggested by one informant, more time may need to be spent with some physicians than with others. Or it may be of interest periodically to devote particular study and effort to specific types of cases, for example, infectious syphilis, or perhaps central nervous system syphilis.

Actually, according to a personal communication dated June 4, 1956, from Dr. Warfield Garson, chief, venereal disease section, North Carolina State Board of Health, since 1953 (about 1 year after this survey) the general procedure outlined has been carried out in

North Carolina with STS reports emanating from the State laboratory of hygiene.

Whenever a case of possible primary or secondary syphilis is brought to the attention of the State board of health through surveillance of laboratory reports, a confidential serology report is routinely sent to the county health officer in the physician's area. The health officer is requested to contact the private physician concerning reporting the case and to offer consultative, diagnostic, and epidemiological aid. In many instances, a venereal disease investigator on the staff of the State board of health or the county health department gets in touch with the physician and attempts to make a working arrangement for carrying out contact investigation and other indicated public health measures. These procedures have allowed for an increase in private physician reporting of syphilis from 7 percent of the total cases in 1953 to 35 percent in the fiscal year 1956.

As suggested by our informants, some physicians may resent this type of health department action. Depending on local circumstances, the benefits may or may not be worth the price. Additional physicians may begin to send their blood specimens to private laboratories in order that the health department will have no record of the tests. Others may choose to use initials or code numbers instead of correct names on the laboratory slip. However, when this happens the health department could still conceivably discuss the case with the physician, clinical and epidemiological problems could be reviewed, and contacts could be reported for investigation.

Summary

During a survey of public health problems in the management of syphilis by private physicians, 101 private physicians and 8 public health physicians in central North Carolina were interviewed. This report discusses survey findings relating to case reporting. Results are based chiefly on interviews during 1952 with 74 private physicians who answered a set of standardized questions.

Two-thirds of the 74 informants indicated that they did not submit case reports on some of their private syphilitic patients. The most

frequent explanation for "failing to report" cases of syphilis was fear that the information would not remain confidential.

Most frequent reasons "for reporting" cases were that it was legally required, that the health department needed reports in order to carry out specific control procedures, and that reports were needed for statistical studies.

The majority of informants said they would be in favor of the health department using positive reports of serologic tests for syphilis (STS) on blood samples sent to the public health laboratory, as a basis for case reports. However, a sizable minority were opposed to or undecided about this procedure.

The findings of this survey cannot be applied uncritically to other areas. However, certain lines of action by health departments to improve syphilis morbidity reporting are suggested:

1. Do everything possible to protect the confidentiality of syphilis case reports. Consider physical protection (files and locks), the number of people having access to reports, and the training of personnel in medical ethics. Let physicians in the community know the measures being taken to keep reports secret.

2. Restudy the entire communicable disease reporting system and, where possible, eliminate paper work required of the physician.

3. Try to devise ways for making good statistical and epidemiological use of case reports in the local community so that physicians can see the contribution they are making when they report cases properly and completely.

4. Let physicians know that the health department does not attempt to work directly with individual private patients without the physician's knowledge and permission.

5. Consider the advantages (and disadvantages) of using laboratory reports of positive STS as a basis for obtaining complete or nearly complete case reports, for making services such as contact investigation, followup, and clinical

consultation easily available, for keeping in touch with the relative quality of syphilis management in private practice, and for making occasional special studies of particular types of cases.

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This paper is the eighth in a series of reports on the North Carolina Syphilis Studies. The organization and original field of operation were described in a report published in the February 1949 issue of the Journal of Venereal Disease Information. The present study area included the original area plus two additional counties and one additional town. The study was supported by the Division of Venereal Disease of the Public Health Service, the North Carolina State Board of Health, and the School of Public Health of the University of North Carolina.

technical publications

Directory of State and Territorial Health Authorities, 1956

*PHS Publication No. 75.
Revised 1956. 86 pages,
35 cents.*

Revised annually, this directory lists, as of May 1956, the title and location of each State health department and the name of the officer in charge; organizational units of individual States with the names of officials directing the units. Also included are officials of State agencies other than health agencies directing grant-in-aid programs; and State agencies officially designated for the administration of the Water Pollution Control Act and crippled children's services.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

Research Grants and Fellowships Awarded by the Public Health Service in 1955

*PHS Publication No. 469.
1956. 83 pages. 30 cents.*

This annual report lists the research grants and fellowships awarded by the Public Health Service to non-Federal institutions and to individuals for support of research and training in medical and related sciences for the period July 1, 1954, through June 30, 1955.

A preliminary statement explains briefly the entire awards program and summarizes the awards by the seven categorical institutes and the Division of Research Grants for fiscal 1955.

The listings are alphabetically arranged by State or countries, institutions, and investigators or fellows.

Following the name of the investigator is a brief descriptive title of the research, an identifying number which indicates the supporting institute, and the funds awarded for fiscal 1955. Names of fellowship recipients are interspersed alphabetically among research investigators. The type of fellowship, the department of the institution in which the recipient holds his fellowship, and the sponsoring institute are indicated.

Vital Statistics of the United States, 1954 Volume I

*NOVS Publication.
422 pages. \$3.75.*

This volume contains detailed, final statistics for 1954 on marriage, divorce, birth, and fetal and infant mortality for the United States, each State, each county, certain cities, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Summary tables of rates and percentages and an explanatory text are also included.

An extensive introduction explains sources, classification, and interpretation of data, and columns of the life tables.

Issued previously, volume II (1956) comprises particular statistics of mortality in 1954 by State, cause, race, sex, and age, for the areas listed above.

Operational Memoranda on Economic Poisons

*PHS Publication (unnumbered).
1956. 99 pages. Multilithed.*

A guide to the use of public health pesticides, this revised edition describes 23 of the newer insecticides and rodenticides.

It gives the chemical name, chemical formula, physical properties, formulations, precautions, and use experience. Information on approximate costs and tabular data on formulations and measurements is also included.

Public health officials who plan or conduct insect or rodent control programs should find this booklet particularly useful.

Copies can be obtained from the Communicable Disease Center, Public Health Service, Atlanta 23, Ga.

An Outline Guide Covering Sanitation Aspects of Mass Evacuation

*Public health problems in
civil defense*

*PHS Publication No. 498.
28 pages. 1956. 50 cents.*

This booklet is intended as an aid to Federal, State, and local health and civil defense agencies in developing comprehensive plans for sanitation, should it become necessary to move urban populations to rural territory.

The expanded outline covers methods of protection from radioactive fallout for evacuees during transit, at assembly areas, in temporary shelters, and in reception areas.

The publication also defines civil defense terms and describes emergency sanitation procedures.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.



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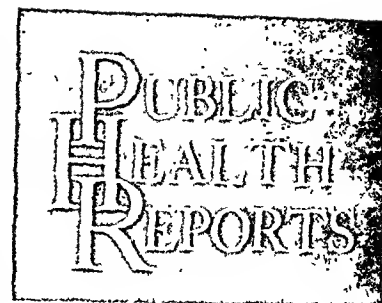
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frontispiece

Toxic chemicals have joined the list of farming hazards, a new and complex field confronting industrial hygienists (see paper by Doyle, p. 145).

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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PUBLIC HEALTH SERVICE

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North American Blastomycosis in an Epidemic Area

By JEROME S. HARRIS, M.D., J. GRAHAM SMITH, JR., M.D., WALTER C. HUMBERT, M.D.,
NORMAN F. CONANT, Ph.D., and DAVID T. SMITH, M.D.

AFTER 10 patients with North American blastomycosis, all from the same area in Pitt County, N. C., were admitted within a month and a half to Duke Hospital, we thought a survey for blastomycosis would be desirable.

Since the epidemic included a child as young as 7 years and a man aged 77 (1), plans were made to examine all persons within a 4-mile radius from the center of Grifton in Pitt County. About 750 were expected. Knowledge about the epidemic became so widespread and community interest so intense, however, that 1,648 people appeared. Many came from nearby areas. The survey was conducted during the week of April 12-16, 1954.

Methods of Study

The survey included skin tests with *Blastomyces* vaccine, histoplasmin, and old tuberculin; complement fixation (CF) tests of blood specimens; and 70-mm. chest X-rays. Children

Three of the authors are associated with Duke University School of Medicine. Dr. Harris is chairman, department of pediatrics; Dr. D. T. Smith is chairman, department of microbiology; and Dr. Conant heads the mycology laboratory. At the time of the study Dr. J. G. Smith was an instructor in the division of dermatology and syphilology, department of medicine, Duke University School of Medicine. At present he is an instructor in the division of dermatology, University of Miami School of Medicine. Dr. Humbert is health officer of Pitt County (Greenville), N. C.

under 6 years were not X-rayed because of the technical difficulty in taking satisfactory pictures, but children in that age group were skin tested. When feasible, their blood samples were obtained also.

The *Blastomyces* vaccine and histoplasmin tests were placed on the right forearm at widely separated points. The tuberculin tests were made on the left forearm.

A 0.1 ml. portion of each of the 3 antigens was injected intracutaneously. In no instance were different antigens used in the same syringe. All syringes were new and were marked with a diamond point to indicate which antigen was to be used. After initial use each syringe was resterilized with other syringes used for the same antigen. The syringe was autoclaved before it was refilled.

The skin tests were read by measuring the diameter of areas of erythema and induration with a millimeter ruler. Skin tests were considered positive when induration was 5 mm. or more, or doubtful when erythema was 10 mm. or more and induration less than 5 mm. All other results were considered negative.

Because of the unanticipated response to the survey, it was necessary to use 3 lots of histoplasmin. Patients (group 1) numbered 1 to 650 were tested with lot HKC-5 diluted 1:500. Patients (group 2) numbered 651 to 1,200 were tested with lot H-42 diluted 1:100, and patients (group 3) numbered 1,201 to 1,648 were tested with lot H-42 also, but the histoplasmin was diluted 1:1,000.

Lot HKC-5 and lot H-42 of histoplasmin

Table 1. Blastomycin and histoplasmin reactions in entire study population

| Blastomycin (mm. induration) | Histoplasmin (mm. induration) | | | | | | | Total |
|------------------------------|-------------------------------|-----|-----|-------|-------|-----|---------|-------|
| | 0 | 1-4 | 5-9 | 10-14 | 15-19 | 20+ | Unknown | |
| 0 | 809 | 65 | 35 | 10 | | 1 | 65 | 985 |
| 1-4 | 221 | 167 | 10 | 11 | 6 | 1 | 16 | 438 |
| 5-9 | 18 | 3 | 5 | 3 | 2 | | 1 | 37 |
| 10-14 | 4 | 1 | | | 1 | | | 6 |
| 15-19 | | | | | | | | |
| 20+ | | 1 | | | | | | 1 |
| Unknown | 3 | | | | | | 180 | 183 |
| Total | 1,058 | 237 | 50 | 27 | 9 | 2 | 265 | 1,618 |

were supplied by Dr. Michael L. Furcolow, chief of the Kansas City Field Station of the Communicable Disease Center, Public Health Service.

Undiluted old tuberculin (Wyeth, Inc.) was supplied by Dr. William M. Peck of the North Carolina Sanatorium for Tuberculosis at McCain and was diluted 1:1,000 before use.

The *Blastomyces* vaccine was prepared in Dr. Conant's laboratory from 6-day yeast phase cultures grown in brain-heart infusion on blood-agar slants at 37° C. The yeast cells were then killed by suspension for 2 hours in a saline solution heated to a temperature of 56° C. The vaccine dilution, though not strictly an extract, will be referred to hereafter as blastomycin.

CF tests with *Blastomyces* antigen were performed by Dr. Joseph Schubert at the laboratories of the Communicable Disease Center, Public Health Service, Atlanta.

Results of Tests

Logistic difficulties made it impossible to test everyone with each antigen; therefore 1,465 persons were tested with blastomycin, 1,383 with histoplasmin, and 1,325 with tuberculin. Forty-two had positive reactions to blastomycin (2.9 percent), 88 to histoplasmin (6.4 percent), and 340 to tuberculin (25.6 percent.)

The fact that acquired histoplasmin sensitivity in some persons will give a cross reaction to blastomycin is well known (2, 3). On the other hand, the converse situation of a positive blastomycin skin test with a negative histoplasmin skin test has been observed not in-

frequently at Duke Hospital in patients with clinical blastomycosis though similar instances have been reported rarely in the literature (4, 5). Of the 1,380 persons tested with both histoplasmin and blastomycin in the survey, 11 had positive tests with both antigens and 27 had a blastomycin skin test of 5 mm. or more of induration and a histoplasmin test showing 4 mm. or less of induration (table 1). Despite the insignificant reactions to histoplasmin, in 6 of the 27 induration from the blastomycin was larger than 10 mm. Conversely, 77 individuals reacted to histoplasmin but not to blastomycin. Thirty-two of these had more than 10 mm. of induration with histoplasmin. The degree of cross sensitivity must, therefore, be small.

As previously noted, 3 histoplasmin antigens were used in the survey: HKC-5 diluted 1:500, H-42 diluted 1:100, and H-42 diluted 1:1,000 (tables 2, 3, and 4). Since H-42 1:100 and HKC-5 1:500 were considered to give analogous reactions, no comparison of the relative size of induration was made (6). The difference in size of reaction to H-42 1:100 and H-42 1:1,000 might be of considerable magnitude, however.

To test that possibility, 13 persons, most of whom were known to react positively to histoplasmin, were tested with 1:1,000 and 1:100 dilutions of lot H-42. The more concentrated solution was injected into the right forearm of 7 individuals and into the left forearm of 6. Both tests were negative in 3 of the 13 persons, but in 3 others induration measured less than 5 mm. with the 1:1,000 dilution and more than 5 mm. with the 1:100 dilution. The remaining

7 had positive reactions to both antigens, but in general the induration was several millimeters larger at the site of the 1:100 dilution.

Dependence of reactivity on the concentration of the dose was also evident in the 3 test groups. Eighty-eight, or 6.36 percent, of all 1,383 individuals tested with histoplasmin were positive. The percentage of positive reactions in group 1 was 6.69 (41÷613, table 2). The percentage in group 2 was 7.57 (29÷383, table 3) whereas in group 3 it was 4.65 (18÷387, table 4). The lower percentage of positive reaction in group 3 may have resulted from the more diluted antigen of histoplasmin.

Nevertheless, the variable of a more dilute antigen in the 387 tests in group 3 does not influence the preceding conclusions concerning cross reactions since only 8 of the 27 individuals with positive blastomycin and negative histoplasmin reactions were tested with the weaker strength of histoplasmin. Seven of the eight

had no reaction to the histoplasmin. Since all controls having a positive reaction to the more concentrated dose of histoplasmin also had some induration from the weaker material, it is doubtful that the 7 would have shown positive reactions to the 1:100 dilution. The individual who showed less than 4 millimeters of induration from the 1:1,000 dilution might have been definitely positive to histoplasmin if he had been injected with the 1:100 dilution. However, that possibility would not invalidate the general conclusion that individuals can be highly sensitive to blastomycin without demonstrating histoplasmin sensitivity. The frequency of the converse situation (histoplasmin sensitivity and blastomycin negativity) is obvious from the tables.

On the other hand, some degree of association between histoplasmin and blastomycin sensitivity in a population can be shown statistically from probability tables. For example, from

Table 2. Blastomycin and histoplasmin reactions in group 1: histoplasmin lot HKC-5 diluted 1:500

| Blastomycin (mm. induration) | Histoplasmin (mm. induration) | | | | | | | Total |
|------------------------------|-------------------------------|-----|-----|-------|-------|-----|---------|-------|
| | 0 | 1-4 | 5-9 | 10-14 | 15-19 | 20+ | Unknown | |
| 0 | 272 | 39 | 11 | 6 | | 1 | | 329 |
| 1-4 | 114 | 137 | 4 | 7 | 6 | 1 | | 269 |
| 5-9 | 6 | 2 | 3 | 1 | | | | 12 |
| 10-14 | | 1 | | | 1 | | | 2 |
| 15-19 | | | | | | | | |
| 20+ | | 1 | | | | | | 1 |
| Unknown | | | | | | | 32 | 32 |
| Total | 392 | 180 | 18 | 14 | 7 | 2 | 32 | 645 |

Table 3. Blastomycin and histoplasmin reactions in group 2: histoplasmin lot H-42 diluted 1:100

| Blastomycin (mm. induration) | Histoplasmin (mm. induration) | | | | | | | Total |
|------------------------------|-------------------------------|-----|-----|-------|-------|-----|---------|-------|
| | 0 | 1-4 | 5-9 | 10-14 | 15-19 | 20+ | Unknown | |
| 0 | 248 | 21 | 15 | 3 | | | 15 | 302 |
| 1-4 | 53 | 23 | 4 | 4 | | | 2 | 86 |
| 5-9 | 6 | | | 1 | 2 | | 1 | 10 |
| 10-14 | 3 | | | | | | | 3 |
| 15-19 | | | | | | | | |
| 20+ | | | | | | | | |
| Unknown | | | | | | | 42 | 42 |
| Total | 310 | 44 | 19 | 8 | 2 | | 60 | 443 |

table 5 it can be seen that considerably more persons reacted positively to both antigens than can be explained on a random basis from the number of reactors to each antigen separately. Eleven individuals reacted to both antigens whereas only 2.4 would have been expected in this group. The difference is highly significant statistically (chi square equals 30.0).

This association may be caused not only by a general hypersensitivity of the skin in these individuals or by a similarity in the antigenic components in the two test materials, but also by a common mode of spread of the diseases so that there would be a statistically significant increased probability of exposure to both diseases over the random chance of acquiring the two on independent bases. Of the 11 individuals who reacted to both blastomycin and histoplasmin, 7 had negative tuberculin tests, 3 had positive tuberculin tests, and 1 was not tested for tuberculosis. These figures are similar to those of the general population and do not indicate general hypersensitivity of the skin in these indi-

viduals. The failure of the blastomycin and histoplasmin tests to show cross reactivity in 101 individuals out of the 115 that were positive for either test (table 5) speaks against the presence of strong common antigens while recent reports of simultaneous infections with blastomycosis and histoplasmosis in humans and dogs is strong evidence for the last postulate of a common mode of transmission (7, 8).

The age variation in the percentage of reactors in the study of tuberculin, histoplasmin, and blastomycin is shown in the figure. The high prevalence and rapid increase of tuberculin sensitivity with age is well known for Pitt County. The graph shows a gradual and poorly defined increase in both histoplasmin and blastomycin reactivity with age. The poorly defined histoplasmin reactivity is in marked contrast to the conditions pertaining in the Mississippi Valley areas (9). The lack of correlation between the reactions of tuberculin and of histoplasmin or blastomycin sensitivity is well demonstrated by the chart.

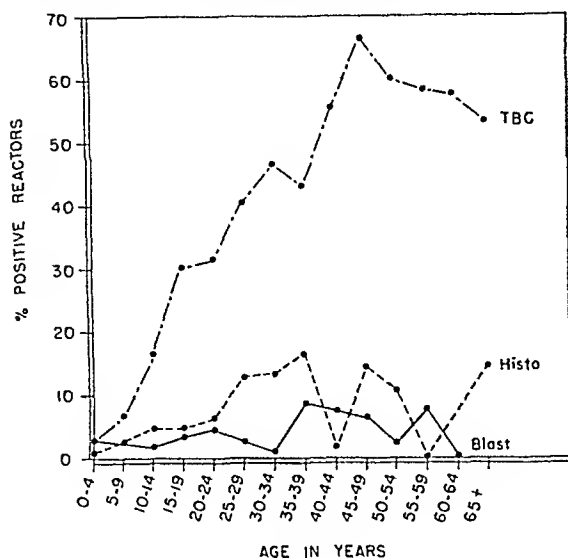
Table 4. Blastomycin and histoplasmin reactions in group 3: histoplasmin lot H-42 diluted 1:1,000

| Blastomycin (mm. induration) | Histoplasmin (mm. induration) | | | | | | | |
|------------------------------|-------------------------------|-----|-----|-------|-------|-----|---------|-------|
| | 0 | 1-4 | 5-9 | 10-14 | 15-19 | 20+ | Unknown | Total |
| 0..... | 289 | 5 | 9 | 1 | | | 50 | 354 |
| 1-4..... | 57 | 7 | 2 | 3 | | | 14 | 83 |
| 5-9..... | 6 | 1 | 2 | 1 | | | 3 | 13 |
| 10-14..... | 1 | | | | | | | 1 |
| 15-19..... | | | | | | | | |
| 20+..... | | | | | | | | |
| Unknown..... | | | | | | | 106 | 109 |
| Total..... | 356 | 13 | 13 | 5 | | | 173 | 560 |

Table 5. Correlation between prevalence of blastomycin and histoplasmin sensitivity

| Histoplasmin | | | | | |
|---------------|----------|----------|----------|----------|-------|
| Blastomycin | Positive | | Negative | | Total |
| | Observed | Expected | Observed | Expected | |
| Positive..... | 11 | 2.4 | 27 | 35.6 | 38 |
| Negative..... | 77 | 85.6 | 1,265 | 1,256.4 | 1,342 |
| Total..... | 88 | 88.0 | 1,292 | 1,292.0 | 1,380 |

Variation with age in prevalence of positive skin reactions to tuberculin (TBC), histoplasmin (Histo.) and blastomycin (Blast.).



Blastomycosis CF tests were performed on 1,275 serums of the 1,648 individuals in the survey. Twelve serums were anticomplementary, 1,220 were negative, and 43 were positive to the CF tests. The titers ranged from undiluted to 32-fold dilutions. The number of positive skin tests in each group showing different degrees of titer are presented in table 6. Complement fixation showed no obvious correlation with blastomycin or tuberculin skin sensitivity. However, although the percentage of positive tuber-

culin tests and of positive blastomycin tests in the group showing complement fixation is similar to the percentage in the general study population, the percentage of histoplasmin reactors is much greater in the former group (30.2 percent) than in the latter (6.4 percent). Further, the individuals having positive CF titers failed to show a much greater prevalence of positive blastomycin skin sensitivity than did the general population (table 6). The significance and meaning of these observations await clarification.

The survey included 1,465 (70 mm.) fluorophotographs; 1,393 (95.1 percent) were negative, 4 were unsatisfactory, and 68 showed some evidence of pathology involving either the heart or lungs. Forty-six large roentgenograms were taken of suspicious lung lesions. However, although many small scars were noted, only one individual was found to have active pulmonary tuberculosis. This result was most surprising in view of the high percentage of tuberculin reactors (25.6 percent) in the study population. Only 17 of the 72 individuals with suspicious fluorophotographs had positive tuberculin tests, 6 had positive histoplasmin tests, and 6 were positive to blastomycin. No instances of pulmonary blastomycosis or histoplasmosis were uncovered although a 31-year-old male who moved to Grifton one month (March 1954) before the survey developed cough and chest pain shortly thereafter. He did not attend the

Table 6. Relationship between skin sensitivity and Blastomyces complement fixation test

| Complement fixation titer | Persons with positive reactions | | | Persons with negative skin tests | Persons without skin tests | Total |
|---|---------------------------------|---------------|--------------|----------------------------------|----------------------------|-------|
| | Tuber-culin | Histo-plasmin | Blasto-mycin | | | |
| Undiluted | 2 | 3 | | 2 | | 7 |
| 1:2 | 6 | 2 | | 6 | | 14 |
| 1:4 | | 2 | | 6 | 1 | 9 |
| 1:8 | 1 | 4 | 1 | 0 | 2 | 8 |
| 1:16 | 1 | 1 | 1 | 0 | 1 | 4 |
| 1:32 | | 1 | | 0 | | 1 |
| Total | 10 | 13 | 2 | 14 | 4 | 43 |
| Percent of total showing positive skin tests ¹ | 23.3 | 30.2 | 4.7 | | | |
| Percent of total population showing positive skin tests | 25.6 | 6.4 | 2.9 | | | |

¹ Percent of total showing positive blastomycin complement fixation who showed a positive skin sensitivity test.

survey because of his recent arrival. In July 1951 he was diagnosed at Duke Hospital as having blastomycosis.

Summary

In an epidemic area in Pitt County, N. C., 1,618 individuals were surveyed for North American blastomycosis by Duke University School of Medicine. Blastomycin skin tests and complement fixation tests were made, and 70-mm. fluorophotographs were taken. Sensitivity to histoplasmin and tuberculin was determined simultaneously.

Of the population, 2.9 percent were sensitive to blastomycin, 6.4 percent were sensitive to histoplasmin, and 25.6 percent had positive reactions to tuberculin. The *Blastomyces* CF test did not correlate with skin sensitivity. No individuals with cutaneous or pulmonary blastomycosis were discovered, and only one individual with active pulmonary tuberculosis was found.

The correlation between blastomycin and histoplasmin sensitivity was carefully studied, but there was little evidence in this survey that antigens common to blastomycin and histoplasmin would explain completely the unexpectedly greater number (11) of individuals who were sensitive to both histoplasmin and blastomycin. The evidence may implicate a common mode of contact with the agents causing sensitivity to these two materials. There was no correlation

between sensitivity to tuberculin and sensitivity to either blastomycin or histoplasmin.

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Dr. Charles-Edward Amory Winslow

February 4, 1877—January 8, 1957

Dr. C.-E. A. Winslow has made an immeasurable contribution; his genius and untiring efforts have placed an indelible mark on the entire world of public health. Many thousands of health workers, like myself, are forever indebted to his teaching, his guidance, and his wise counsel. To the generations that come after us, his wisdom will have an undying influence and stimulus. We have lost a great man whom we have loved, honored, and revered, and whose memory we will always cherish.

—Surgeon General Leroy E. Burney

Central Technical Services of the World Health Organization

By FREDERICK J. BRADY, M.D.

SOME of the technical services of the World Health Organization, which are carried on primarily from the headquarters in Geneva, have importance to the whole world. These activities have come about as the result of over a hundred years of attempts at international cooperation in those health matters that must be undertaken by nations working in concert.

The first abortive activity took place in 1851, when representatives of 12 nations met together to find common solutions to limiting pestilential diseases that periodically swept through most of the world. Unfortunately, in those early days there was no tradition of international cooperation, and the views expressed by delegates regarding the need to cooperate on health matters were not upheld by their governments. This was the beginning of a series of international conferences that, with the growth of scientific knowledge, began to bear fruit after a half century.

In international negotiations each participant, to gain objectives, must be prepared to relinquish certain prerogatives. We are fortunate in that objectives in health are similar for

all nations and that there is a high degree of understanding of each others' problems. This fortunate position has borne fruit in the World Health Organization and has been of immeasurable benefit in protecting the health of the American people. At the same time, health authorities of the various countries have not had to make major compromises, owing to agreement on ends.

WHO programs are varied, evolving from the early negotiations among nations which were concerned almost exclusively with problems related to international quarantine.

International Sanitary Regulations

At present the governments of 132 nations and territories have agreed to abide by the WHO International Sanitary Regulations that became effective in 1952. Twenty-four more governments are bound by these regulations with specific reservations that are published and known to the rest of the world. Eleven nations are not bound, and the position is uncertain in 12 others.

The International Sanitary Regulations are confined to six pestilential diseases, namely, smallpox, cholera, plague, yellow fever, typhus, and relapsing fever. The regulations were drafted not to impose on countries an unnecessary burden of measures to take against these diseases but rather to limit the measures nations could take in order to prevent the disruption of trade and travel while at the same time providing maximum security.

Dr. Brady is assistant chief of the Division of International Health, Public Health Service. His speech, in essentially the same form, was delivered at the annual conference of the National Citizens' Committee for the World Health Organization, November 14, 1956. The conference met with other groups in Atlantic City, N. J., at the 84th annual meeting of the American Public Health Association.

Until the regulations were adopted, 13 treaties and covenants dealing with quarantine were in effect. None was comprehensive in scope: Some were of a regional nature, and some applied solely to one disease or one type of transport. None was ratified by a sufficiently large number of countries. With the exception of the Pan American Sanitary Code, the regulations have replaced all previous treaties.

The International Sanitary Regulations are of great benefit to travelers from the United States because they give advance knowledge of what measures quarantine authorities in various countries may apply and also prevent overzealous authorities from taking unduly restrictive measures.

International Disease Reporting

Related to work on quarantine are the epidemiological intelligence activities of the World Health Organization. WHO regularly receives notifications of cases of quarantinable diseases which it then analyzes and transmits to health administrations, by radio bulletins and in weekly reports, thus providing health authorities with up-to-date knowledge on the distribution of quarantinable diseases.

The reporting program has been extended to other important communicable diseases and even to the degenerative diseases, making it possible for WHO to publish analyses and reports on their prevalence throughout the world.

Soon after its organization, WHO established an international system to detect any unusual outbreak of influenza lest a pandemic such as that of 1917-18 reoccur. The highly competent virus laboratories of the world form a network for reporting any unusual prevalence or virulence of the influenza virus. It is hoped that with adequate notice, vaccines can be prepared from dangerous viruses to keep outbreaks from reaching epidemic or pandemic proportions.

With the degree of protection afforded by the Salk vaccine, the prevalence of various strains of poliomyelitis virus assumes a new importance. It is also important to know whether presently unknown strains of poliomyelitis virus exist in the world. To meet these problems, WHO is encouraging virus laboratories

to determine the strains of poliomyelitis virus endemic in their localities and to watch for previously unrecognized strains.

WHO, as the coordinating authority in international health, is unique in its ability to collect, analyze, and compare health data from various parts of the world. The Organization presently is studying a proposal to organize registries of pathological tissues into a worldwide network, thus permitting interchange of specimens and diagnoses for comparative purposes.

Our knowledge of pathology is based almost entirely on specimens from Europe and North America. In the past we have generalized from these materials, assuming that our knowledge has universal application. In several diseases thought to be the same throughout the world, detailed descriptions of pathology lead to speculation whether the diseases observed are the same or whether similar but different diseases exist.

At this time it is not known in what area the World Health Organization will make a modest beginning in these activities, but one would expect that any disease chosen for study would have an unexplained, bizarre distribution pattern. One could foresee in this proposal an opportunity to further knowledge of pathological processes and also to provide unique opportunities for training.

International Drug Programs

International cooperation in dealing with drugs and other therapeutic substances has become a necessity. WHO activities relate particularly to the recommendation of standards for establishing common names and determining the purity and potency of drugs moving in international commerce.

Because some therapeutic substances of great importance in medicine today cannot be tested for purity and potency by physical and chemical methods, their analyses must be based on biological procedures. Unfortunately, biological standardization does not lend itself to the niceties of chemical or physical determinations but must take into account the variations in the response of living organisms used in tests.

Standard or reference samples become of great importance.

With the assistance of experts and cooperating laboratories from all over the world, WHO has so far established 66 biological standards for vaccines, serums, hormones, antibiotics, and enzymes. Standardization has resulted in providing international units that assure physicians the world over of the dosages they are prescribing.

Sometimes we are inclined to overlook the importance of national pharmacopoeias. Prescriptions for drugs were issued in ancient Egypt as long ago as 2800 B.C. Pharmacopoeias began to appear in Europe in the 16th century. The United States has had an officially recognized pharmacopoeia since 1893, serving as the basis for the purity and potency of our drugs.

Today, with the spreading use of modern drugs, at least 40 nations have official pharmacopoeias, which they revise from time to time, and other countries are preparing pharmacopoeias or specifications. There is a resulting urgency to achieve greater uniformity of standards so that the drugs will have comparable composition and potency no matter where they are produced.

While this problem has been a matter of concern to pharmacopoeial authorities for many decades, it was only after the World Health Organization came into existence that an international pharmacopoeia was completed. The International Pharmacopoeia is a model for governments to use in drafting their own pharmacopoeias.

It is noteworthy that the chairman of the United States Pharmacopoeia Committee was active in developing the International Pharmacopoeia and that the second volume was widely circulated before publication to pharmacologists and drug firms in the United States. Reports from various sources indicate that pharmacopoeial committees in different countries are being guided by the specifications recommended in the International Pharmacopoeia.

A related problem is that of advising governments on acceptable names of drugs of international importance, names that nations are willing to protect against trademark rights.

Examples have come to light where a trade-

mark has been issued to a vested interest for a name in such common use as penicillin or cortisone. Royalties, of course, are then paid to the owner of the trademark by the manufacturer and importer of the drug even though the owner did not contribute to its preparation or importation.

To prevent such vicious practice, WHO, on the advice of experts, recommends a name for a drug to each country, asking that the country examine its trademark files to be sure that the name has not been preempted. If no objection is received within 4 months, WHO recommends that the name be protected against trademark rights throughout the world.

More than 200 nonproprietary names have been recommended by the World Health Organization and accepted by the governments as the official names of these drugs. This is no little accomplishment when it is realized that such names should be readily pronounceable in three languages and should not have been preempted by another product already trademarked in any of 80 countries. This activity has been a boon to manufacturers and consumers as well as to the prescribing physicians and research scientists who can specifically identify a drug whatever its origin or labeling.

WHO also has a role in the worldwide control of addiction-producing drugs. The United Nations, by virtue of international conventions, brings illicit traffic in addiction-producing drugs under international control. On behalf of the UN, the World Health Organization determines which drugs are addiction producing and therefore subject to control. To make such determinations, the organization is aided by experts, who in turn seek advice from research laboratories.

Vaccine Field Programs

Another major area in the central technical services of the World Health Organization is stimulation of research activities which, by their very nature, must be carried on by cooperation among countries.

An example is research on the effectiveness of typhoid vaccines prepared by each of several methods. The value of these vaccines became of concern to several Western countries when ty-

phoid fever appeared in individuals who, as a result of recent vaccinations, presumably were immune.

WHO selected a country with a high typhoid attack rate and assisted the country in setting up well-controlled experiments to ascertain not only the value of vaccine but also the effectiveness of several vaccines tested.

Similarly, WHO demonstrated the effectiveness of hyperimmune serum against human rabies and the effectiveness of canine vaccine in countries where the occurrence of rabies was sufficient to make valid comparisons. Both the hyperimmune serum and the vaccine were developed in the United States, but definitive tests could not be carried out because of relatively low attack rates.

In this discussion, I have tried to bring out some of the activities of the World Health Organization that cannot be carried out by single nations but that require collaborative effort among many. Each activity substantially benefits the United States even though the results are not as readily apparent or as tangible as those of a field program aimed at the control or eradication of disease. These are the activities in which there must be collaboration by many governments. We are indeed fortunate that this collaboration can be carried on through this effective international agency, the World Health Organization, in an atmosphere of understanding of the problems of each and of looking toward common goals.

Advisory Committee on Nurse Traineeships

Twelve leaders in nursing, hospital administration, and medicine will serve on the Expert Advisory Committee for the Professional Nurse Traineeship Program.

The committee will advise the Public Health Service on the new 3-year program which provides funds to enable graduate nurses to get advanced training in supervision, administration, and teaching.

Committee members are: Dr. Robert Berson, vice president in charge of medical affairs, University of Alabama, Birmingham; Lawrence J. Bradley, director, Genesee Hospital, Rochester, N. Y.; Miss Ann Burns, chief, division of nursing, Ohio State Health Department, Columbus; Rev. John J. Flanagan, executive director, Catholic Hospital Association, St. Louis, Mo.; Miss Ada Fort, dean, School of Nursing, Emory University, Atlanta, Ga.;

Miss Frances Frazier, in charge of graduate program in public health nursing, Teachers College, Columbia University, New York City; Mrs. Lulu W. Hassenpflug, dean, School of Nursing, University of California, Los Angeles; Miss Katherine Hoffman, assistant dean, School of Nursing, University of Washington, Seattle; Miss Helen Nahm, director, department of baccalaureate and higher degree programs, National League for Nursing, New York City; Miss Agnes Ohlson, president, American Nurses' Association, and chief nursing examiner, State Examining Board, Hartford, Conn.; Miss Marguerite Pactznick, director, nursing service, Denver General Hospital, Colorado; Mrs. Margaret Filson Sheahan, director, nursing service, University of Chicago Clinics, Illinois.

Residence Laws

The many social, economic, and psychological aspects of today's State residence laws were considered at three sessions of the 83d annual forum of the National Conference of Social Work in St. Louis, May 19-25, 1956.

The following résumé of significant points in the papers on residence laws was prepared by the Tuberculosis Program of the Public Health Service.

The full papers have been published in a symposium entitled "Residence Laws: Road Block to Human Welfare" by the National Travelers Aid Association, New York City.

In the symposium, Laurin Hyde, general director of the National Travelers Aid Association, who organized and presided over the sessions, gives a brief history of residence laws. He also presents the "Statement of Principles on Residence Laws," which was adopted on March 23, 1956, by the association, leader in the current effort to amend the laws.

A Fluid Labor Force and Our Expanding Economy

Mobility has been, and perhaps will remain, the most dramatic example of what men can do if they are free to seek their own destiny in their own way, according to Robert C. Goodwin, director, Bureau of Employment Security, Department of Labor.

Except during the depression of the 1930's, each decennial census since 1890 shows that progressively larger percentages of the total population of the United States have moved from the States in which they were born. Experience during the war period proved that free people will respond to intelligent guidance.

"Free people are not moved, they move," he said. They move in response to very specific stimuli, more often than not economic, which apply to them as individuals.

Goodwin referred to the Wagner-Peyser Act of 1933, which established the present United States Employment Service and gave national recognition to the need for intelligent guidance of labor mobility. This legislation, he said, along with the Federal-State system of unemployment insurance, provided the first effective nationwide tools at the Government's disposal for improving the functioning of the labor market.

As to the future, Goodwin said that all signs point to continued mobility of our labor force. Huge metropolitan areas are increasingly

plagued by a transportation glut discouraging further industrial expansion. Huge concentrations are more vulnerable to enemy attack. Changing management concepts see greater efficiency in decentralized operations.

New means of communication make these concepts practical, he said. In addition, the development of economical power from nuclear energy may make industry possible in rural areas where it is now impossible. All this, he feels, adds up to a foreseeable greater need for the increased or at least maintained movement of people, but it may be a much more selective process than it is today.

Goodwin concluded with a challenge to those who deal with men in their social relations to see to it that they have the freedom to move without needless restraints, and that society provides them with the help they need in making the social adjustments accompanying their search.

Human Values and Personal Problems of Movement

The motives for migration, why persons and families make a change of residence, were examined by Elsie M. Rogers, executive secretary, Travelers Aid Society of Long Beach, Calif.

The complexity and variety of reasons she presented all have in common what she termed "a basic urge for security." Problems sometimes resulting from mobility are equally complex and varied, ranging from those affecting the individual to those affecting whole social groups of society. Extensive and intensive publicity about the availability of well-paid technical jobs in this or that industrial area has wide appeal. Then, the skilled technician has a buyer's market if he isn't too set on working in a specific area, but there is often no way of knowing ahead of arrival whether there is need for his skills.

Industry assumes little or no responsibility in situations where the employee's funds are exhausted before he draws his first pay. Illnesses may develop suddenly. Hostile attitudes toward newcomers or cultural groups may be encountered locally. In the agricultural field,

even though the migrant farm worker is essential to our economy if our crops are to be harvested and our people fed, legal rights depend on where one lives rather than where one works, and the migrant farmer has almost no legal rights.

The strange vagaries of our residence laws also affect the serviceman and his family who since 1940 have been moving between military posts. Though they may have been based and have lived in a given community for 1 to 6 years, they have no rights to certain benefits in that community because they do not meet State residence requirements. Another phenomenon of our new industrial age is the "company man" and his family who contribute substantially to the statistics on moving persons.

Yet, in comparison with the enormous annual migration of workers in the United States, Rogers reminded, the number who encounter problems with which they need agency help is very small. She concluded that the penalty for unawareness of these social problems arising out of our changing way of life rests with all of us. Awareness is, she said, the responsibility, and the opportunity, we have for pioneering a path toward the solution of such problems so that those who meet the challenge of a mobile labor force are not penalized.

What Happens in a State Without Residence Requirements

Peter Kasins took issue with what he termed "existing conflict in our own culture regarding the treatment of strangers"—the deep-seated disposition to extend a helping hand accompanied by a fear that helpfulness expressed in public policy may invite abuses.

Viewed in economic terms, according to the deputy commissioner for New York City affairs, New York State Department of Social Welfare, residence laws interfere with the free flow of labor and serve as a deterrent to adventure and risk-taking. Viewed in legal terms, they are in fact, if not in theory, a denial of the right of freedom of movement. Considered in social terms, they work unnecessary and often cruel hardships on people whose only fault is a willingness to take a chance.

Kasius said the time is propitious for each State to examine its own practices, to take careful note of the changing character of assistance programs, and to observe the effect of outmoded residence laws upon economic and industrial activity.

He presented certain features of this problem as seen in the experiences of one State, and particularly one city, which has had a long and troublesome history in dealing with the issue. This is the city and State of New York, and it is in New York City, as would be expected, that the greatest concentration of non-residence cases are found. Approximately 80 percent of that State's charge load is found in New York City, as compared with a 65 to 35 ratio for the total public assistance loads as between the city and upstate. But, even this disproportion should not be surprising, he said, when we consider that 13 million people move in and out of the metropolis each year. What is really amazing, he stated, is that the casualty list, as measured by relief figures, is so small.

Kasius concluded that State residence laws are reminiscent of the day when there was precious little difference between the treatment of a pauper and a criminal. He said "it is high time that we got rid of them."

The Cost to Children of Restrictive Residence Laws

The plight of children in a situation created and made worse for individuals and families by restrictive residence laws, the children who are part of the mobile family group and the children who are left behind when their parents move to another city, was described by Edna Hughes, field consultant, Child Welfare League of America.

Some intrastate laws have one residence requirement for foster home care, another for certain kinds of institutional care, and still another for medical care, with a place for State payments to fill in the gaps. Under the law and policy of one State, she said, a survey of 10 counties found 159 children who either had to be removed from foster care because their parents had lost State or county residence or their

guarantee of financial support had to be removed.

Hughes presented some common convictions about the operations of restrictive residence practices affecting children:

- Every child should be enabled to live with his own parents or a relative when they can provide a suitable home.

- Financial assistance and service to enable a child's family to nurture him should not be denied by reason of governmental boundary lines, State or local.

- Every child without parents, or whose parents cannot provide a full measure of love, care, and supervision, should receive the protection of a social agency, voluntary or governmental, without regard to the State, county, or township origins of his parents.

- A child should be returned to his parents, relatives, or the community from which he came only on the basis of a social study and a social plan which attempts to obtain for him a home and family ties.

- Respect for personality and belief in the brotherhood of man mandates us to make resources available on an equitable basis to families and children wherever they may be whenever help is needed.

In concluding she invited consideration of what the family or children's agency, public or private, can do toward solving the residence problem as it affects children. She proposed three fronts on any one or all of which she feels the challenge may be met. It is believed, she stated, that social work knowledge, skills, and experience offer to social workers and social agencies their best resources for developing methods that will be effective with this particular problem, whether it is attacked at the case, the policy, or the legislative level.

Impediment to Psychiatric and Mental Health Services

Dr. V. Terrell Davis, director of mental health, New Jersey Department of Institutions and Agencies, presented data which he feels show how restrictive residence requirements not only hamper psychiatric and mental health services, but also hamper and impede economic

progress and development of the community. He approached the question by discussing what he feels are essential features in any program for psychiatric and mental health services and by considering how these features might be restricted by residence requirements.

Davis pointed out some definite, bright signs of progress in dealing with underlying factors which may be contributing to "the symptom of restrictive residence requirements." These signs include the Interstate Mental Health Compact and an extension of Blue Cross hospital insurance coverage to include short treatment in psychiatric units of general hospitals in some areas of the country. There is also a gradual and continuing change in basic concepts of hospital admission and commitment procedures in the case of the mentally ill, with greater emphasis on procedures for voluntary admissions. Expenditures for mental health services are increasingly recognized as investments in human productivity rather than as money grudgingly spent for the care of incurables. And there is increasing legislative, community, and administrative support of the policy of treating emotionally disturbed individuals wherever they are found with the most effective and appropriate procedures available, and resolving separately the question of who is to pay.

In concluding, Davis said he believes we have definite indication that these trends, which seem to be present, may be expected to continue and develop. He said there is a growing feeling of mutual trust and respect between the professional and administrative personnel of various State and community groups. As a result, he said, these personnel have less concern about the possibility of having mentally ill patients who are nonresidents "dumped on" their facilities and resources.

Let's Face Up to Restrictive Residence Laws

"There is surely no more embarrassing anachronism in our present social structure than the body of law and practice that denies public benefits to persons whose sole disqualification is their lack of a specified period of residence in the State, county, or locality in

which they happen to find themselves," Elizabeth Wickenden, consultant and writer on public welfare, asserted.

To lend color and force to her remarks, Wickenden presented an imaginary interview between an American social worker and a visitor from Mars.

The social worker tries to explain the existing social arrangements for assisting individuals overwhelmed by economic want or other personal disaster. However, each question from the imaginary Martian places the social worker deeper and deeper into the web of legalistic barriers that close forever the doors of assistance to those not possessing the open sesame to all our social provisions: the right of legal residence. The visitor expresses great surprise at finding what he terms "village psychology" so hardy in 1956 America, especially, he says, in view of our strong nationwide economy and present role of world leadership. He says further "... it does appear that if you earthbound social workers really believe what you say about the rights of individuals, the dignity of man, the universality of social responsibility and the ability of democratic countries to shape their own social institutions to the needs of their people, you should be able to find some way to wipe out these pockets of second-class citizenship that cause you such embarrassment."

Medical Services Hampered by Restrictive Residence Requirements

The possibilities that may ensue when a tuberculosis patient is refused treatment were presented by Ruth B. Taylor, chief medical social consultant, Tuberculosis Program, Public Health Service.

The economic losses in any of these eventualities are unquestionably greater than the cost of hospitalizing the individual upon discovery of the disease, she pointed out. To some extent, however, she said, nonresidents with tuberculosis fare better than other nonresidents because the communicability of the disease is a strong factor in encouraging liberal policies. Relaxation of restrictions against these patients is, she stated, undoubtedly the result of

arduous effort on the part of public health officials. Although there is much variation throughout the country, several States have abolished (or never had) legal residence requirements for tuberculosis care, and others have ignored residence restrictions when unable to effect changes in them.

Taylor discussed a series of studies being conducted by the Tuberculosis Program, Public Health Service. These studies are designed to determine answers to specific questions about medical problems of nonresidents since data on this subject are largely nonexistent. During the 3-year interim between the first and last studies, isoniazid was introduced, and the pressures for beds have lessened in some communities. For these and other reasons, comparability and representativeness of the data cannot be claimed. However, she said, material emerging from these studies has contributed to a clarification of the nonresident problem, and current efforts are designed to determine how generally applicable the findings are to other States.

She summarized 10 major findings of the study in 22 communities in the north, southeast, midwest, and far western sections of the United States. Although these limited data allow one to draw only tentative conclusions, they have a commanding significance.

It was found that newcomers to communities do not appear to contribute disproportionately to the tuberculosis problem and nonresidents are a relatively small segment of the tuberculous population. Tuberculous nonresidents were fairly representative of the total

tuberculosis patients. They had a somewhat similar age, race, and sex distribution and had no unusual social characteristics. But they form, more or less, a cross section of the various social and economic strata. No evidence was found to support the assumption that liberalization of policies and availability of resources produced an influx of people desiring to take unfair advantage of this liberality. States from which nonresident patients migrated were widely scattered geographically. A number of other countries also were represented.

With some exceptions, citizenship did not prove to be as significant a factor in determining eligibility for tuberculosis care as residence. The overwhelming majority of nonresident patients had no established legal residence. Health officials were fairly consistent in their desire to provide needed medical services to tuberculosis patients regardless of legal residence. Sanatorium directors, welfare officials, and other investigating agents (including some professionally trained social workers) were more diverse in their reactions and frequently resisted any liberalization. The majority of the patients were hospitalized initially, but differences in philosophies were revealed in subsequent disposition.

Taylor feels the many variations in attitudes and policies toward persons with problems who do not "belong," reflect a need for an integrated and intensive program of interpretation, especially between health and welfare agencies which are presently often working at cross purposes.

Proceedings Against Four Coal-Tar Colors

A ban on four coal-tar colors used in foods is sought in proceedings begun by the Food and Drug Administration in January 1957. The colors FD&C Yellow Nos. 1-4 are involved. Nos. 3 and 4 are used extensively in coloring butter and oleomargarine.

Animal studies show that large intakes of these colors could cause injury, although no instances of harmful effects on humans have been reported. The law requires that an approved coal-tar color must be harmless regardless of the amount consumed.

The Prepayment Challenge

By W. PALMER DEARING, M.D.

BEFORE BEGINNING a discussion of the prepayment challenge from the viewpoint of a Government official, it may be well to recall that in the United States all of us are the Government. Any presentation of a Government view, therefore, must undertake to reflect the composite view of all of society, the professions, the consumers, the farmers, the businessmen, and so on. The authoritative interpretation of this view is made by Congress, which finally sets the policies, provides the funds, and reviews the performance of those of us who serve the public.

First, I propose to offer a few comments concerning the current status of health insurance and some of our hopes for the future. Then I will review some of the current Government programs which will affect and, we hope, stimulate the growth and improvement of health insurance.

I think it particularly appropriate to point out that voluntary health insurance has both fiscal and health aspects. Insofar as insurance encourages our citizens to seek medical care early, without financial deterrent, and eliminates worry over medical bills by the sick individual, its fiscal aspect contributes to health improvement. The health aspect, however, needs specific attention if the potential contributions of health insurance to health maintenance and restoration are to be fully realized. This means attention to the type, quality, and efficiency of the health services which are available through insurance. Encouragement of

comprehensive care, with proper emphasis on preventive services, and organization of service so that skilled specialty service is available when needed, but without waste, are examples of the health, as distinguished from the fiscal, aspect of insurance.

Characteristics of Prepayment Plans

Turning now to medical service plans in operation, let us note and comment on several aspects as follows:

- Insurance for care of short-term illnesses rather than for major medical expense.
- Simplicity of administration.
- Nursing and convalescent services.
- Preventive services.

First, the benefit structure of present prepayment plans is designed primarily to provide protection against the cost of short-term hospitalized illness, the most frequent cause of unpredictable medical bills.

We need now to break down the problem of medical care costs further, to look at the components of the medical bill, particularly those which involve heavy financial burdens. Urban families, for example, on the average spend only 2 cents of their medical dollar for nursing services in the home or hospital, exclusive of nursing furnished as part of hospitalization. Urban families with large medical bills of \$1,000 or more, however, spent, in 1950, 14 cents of their medical dollar for nursing services. Even these averages obscure wide individual variations. Some families spend 66 cents or more of each medical dollar for nursing services. Medical care costs to the individual differ, depending on the nature of the illness, family circumstances, entitlement to care under industrial and

Dr. Dearing is Deputy Surgeon General of the Public Health Service. His paper was one of a series on prepayment delivered at the Western Conference of Prepaid Medical Service Plans, Sun Valley, Idaho, October 12, 1956.

public programs, and other factors. The items which make up the less usual, but frequently catastrophic, medical bill need to be reexamined with a view to providing benefits more nearly in line with medical needs and services.

Despite the brief period in which major medical expense insurance has been offered, more than 5 million people now carry this type of coverage (1). Another step toward more complete protection is the extended benefits proposed by Blue Cross-Blue Shield plans. Some of these plans have experimented with limited coverage of care in convalescent homes and chronic illness hospitals, of the cost of expensive drugs and of special duty nursing. A start has been made by prepayment plans toward coverage of dental services. Progress along all these lines is essential.

To meet the needs of the buying public, we also must have an administrative base for broader health insurance offerings. Physician and hospital service plans, for example, have developed methods for joint administration of enrollments and claims. Coverage of nursing home and convalescent care has been worked out within the administrative organization of some Blue Cross plans. If it were possible to extend hospital services to provide special nursing and other auxiliary services in the home as well as in the hospital, we would have a practical base for insuring the costs of these services. This kind of arrangement would not only relieve the hospital of many nonacute long-term patients, it would also be a most valuable aid to the family physician and would reduce the costs of care.

A few hospitals now offer organized home care services. To a considerable extent, these services now are especially adapted to the needs of the indigent patient. A program similar to the home care offered by hospitals, though not necessarily as elaborate, could assist the family physician to care for his patients at home and help include these services in voluntary prepayment arrangements.

Another challenge to voluntary health insurance is the development of preventive health services. This is sound insurance practice as well as beneficial for the health of the subscribers. Well over 150 plans now offer insurance for a wide range of physician services in-

cluding diagnostic and preventive health services (2). These plans, like the Health Insurance Plan of Greater New York and the Permanente and Ross-Loos groups on the west coast, have proved it is feasible and practical to encourage the use of preventive service by insurance. Some of these plans carry on organized health education activities among their membership. Early detection and diagnosis of disease help to ease the burden of heavy medical care bills. Inclusion of diagnostic laboratory and X-ray services helps to encourage prompt attention to illness and early treatment.

Insurance carriers and the personnel who provide health services share with public health agencies the responsibility for preventive health activities. They also desire the development of health facilities and resources and their effective use for improving patient care. Some prepaid medical care plans now use the immunization, laboratory, and other services of public health departments, but many are not even aware of them. And there is also joint responsibility for health education of the public and for the development of new public health measures. We look to prepaid medical care plans for assistance in improving public health services so that they may better meet their own needs as well as those of the public generally.

Stimulating Voluntary Insurance

Now, let us turn to some of the things the Government is doing which will affect and help extend and improve voluntary medical service insurance.

One of the major health goals of the Administration is to help encourage and strengthen voluntary health insurance. Accordingly, the Administration has urged legislation which would authorize Federal reinsurance to stimulate improved coverage and expanded protection for more people. It has also sought legislation to permit small insurance carriers to pool or share their risks in developing better protection.

The Federal Government has acted in another respect to stimulate the development of sound voluntary health insurance. People have suffered from misleading advertisements, cancellation clauses buried in policies, special

riders providing for various types of exclusions, and limitations that policyholders did not understand when they paid their premiums. Action has been taken by the Federal Trade Commission during the past 2 years to correct misleading advertising. Under this stimulus, insurance companies are examining the fine print in their contracts and improving their practices from the viewpoint of the consumer.

In addition to these roles of stimulation and regulation, the Federal Government has embarked on other programs designed to improve medical services for the American people. Among these are medical research, aid to States and communities in the construction of health facilities, fellowship and training programs to relieve shortages of professional manpower, and factfinding and analysis relating to health problems, needs, and resources. In addition, the Government is working with hospital, nursing, and other groups to explore methods of reducing the costs of care. And finally, the Government is developing new methods of providing coverage for special groups such as members of the armed forces and their dependents and Federal civilian employees.

Several of the programs mentioned are new or have been recently expanded. Congressional appropriations for medical research funds were increased markedly in 1956. About half of the total national budget for medical research is financed by Federal funds, mostly distributed as grants to universities, medical schools, hospitals, and other nongovernment research institutions.

Medical research has already paid enormous dividends in reduced costs of institutional care. The savings that have accrued as a result of the discovery of antibiotics, for example, can hardly be estimated. Although it was only a short time ago, relatively few remember the exorbitant costs of care for chronic osteomyelitis, or for chronic bladder infection, or for the parietic patient. On every hand, research has paid dividends far beyond its cost.

At the same time, application of research results changes the pattern and the cost of the service which voluntary insurance undertakes to provide. Early ambulation and better control of infection shorten the period of treatment but increase the per diem cost of hospital

care as compared with the days of long convalescence with little need for expensive procedures and drugs.

The local-State-Federal program of hospital construction was broadened 2 years ago to include Federal aid in the building of chronic disease hospitals, nursing homes, diagnostic and treatment centers, and rehabilitation facilities. This program encourages flexibility in community health planning and more efficient use of manpower and resources. At the request of the Administration, this program was extended in 1956 for an additional 2 years.

Congress, also in 1956, enacted legislation to provide financial aid for the construction of medical research facilities. The Administration's recommendation for aid in the construction of medical training facilities, however, was not enacted. The Secretary of Health, Education, and Welfare has stated that the Administration will continue to press for legislation to authorize grants for teaching facilities so that the supply of badly needed research scientists and physicians may be increased.

Congress, at the recommendation of the Administration, in 1956, also authorized a program of traineeships for professional public health workers and for graduate nurses, to help prepare more nurses for supervisory and teaching positions. This legislation, in addition, authorized grants to the States for the extension of practical nurse training. The funds appropriated for the National Institutes of Health of the Public Health Service furthermore will permit a substantial expansion of fellowships and traineeships to promising young research scientists and physicians throughout the country.

Better Use of Facilities

In working toward reducing the practical barriers to medical services we need to look toward a more rational utilization of facilities and personnel, with patients cared for in the facilities appropriate to their illness. Wider use of home care, outpatient facilities, and nursing homes offers great promise, both as a method of improving the use of health manpower and facilities and of reducing the cost of care. We also need to study such innovations as the

"minimal care unit," the "hospital hotel," and the "day hospital" for the care of patients during that portion of the 24 hours when families are unable to provide care.

The Department of Health, Education, and Welfare, in September 1956, initiated a co-operative study of various types of hospital units to develop recommendations on the organization of facilities more closely related to the specific needs of patients. To assist in this task, the Secretary has appointed an advisory committee composed of physicians, hospital administrators, and nurses. Dr. Russell Nelson of Johns Hopkins University is chairman. The primary objective of the committee is to help hospitals improve care and reduce costs, particularly for patients who need only limited services. The committee, in addition, may wish to consider the problem of extension of extra-mural hospital services as a base for insurance against the costs of special nursing and other auxiliary health services in the home.

There are longstanding programs for complete care of personnel of the uniformed services and medical benefits for civilian employees injured at work. Care has also been provided for dependents of uniformed personnel but only to the extent that facilities of the particular service are available. Modern industrial health care for civilian employees, however, is provided only on a limited basis. The Administration's proposals for a voluntary health insurance plan for Federal employees, participated in by the Government as an employer, have not been enacted into law.

The most significant action in the field of health care for Government employees is the dependent care law, which will make full use of the Government's plant by opening hospitals and outpatient clinics of any uniformed service to dependents of any other. It will also remove discrimination against the estimated 800,000 dependents to whom suitable service facilities are not available by authorizing payment for hospitalization and medical care for hospitalized illness of dependents by nongovernment physicians in nongovernment hospitals.

Since 1950, the Federal Government has participated in the financing of direct vendor payments for medical care of recipients of assistance under the Federal-State welfare pro-

grams. A new program enacted in 1956 authorizes a special earmarked grant for medical care for these recipients. The program will facilitate more adequate payments to hospitals, physicians, and other personnel for services to the indigent and thus have an impact on health insurance financing.

Health Status Survey

Finally, the Federal Government has an important role in collecting information on the extent of sickness and disability and of the use of health services. These are the facts with which voluntary health insurance plans must work in expanding and extending protection. The 84th Congress provided for a continuing national survey of sickness and disability to provide comprehensive information on national health problems. In carrying out this program, it is essential that the needs of prepaid medical care plans be taken into account. The active cooperation of voluntary plans will improve the usefulness and value of the survey. Advisory committees now being set up will assure that the data will be of maximum benefit to various groups.

The national survey will yield current information on the health status of the general population. For factual data on the special groups covered under individual health insurance plans, more information should be obtained by the prepayment plans. Much of the information now gathered is not brought together. Much of what is compiled is not comparable from plan to plan. These specific data would be helpful in planning broadened coverage and in reviewing administrative organization.

Consideration should be given to an expanded research program on the economics of medical care. Establishment by the Blue Cross-Blue Shield plans of a clearinghouse for information about utilization and costs would stimulate greater uniformity in data collection and would be an important step toward improving our knowledge of the problems to be solved.

Great progress has been made and is in prospect to improve prepaid medical care and to help more American families budget against the costs of care. All of us have a stake in this job. All of us are faced with the challenge.

It will take the combined efforts of the health professions, of insurance plans, of industry and labor, and of Government to carry us closer to the goals.

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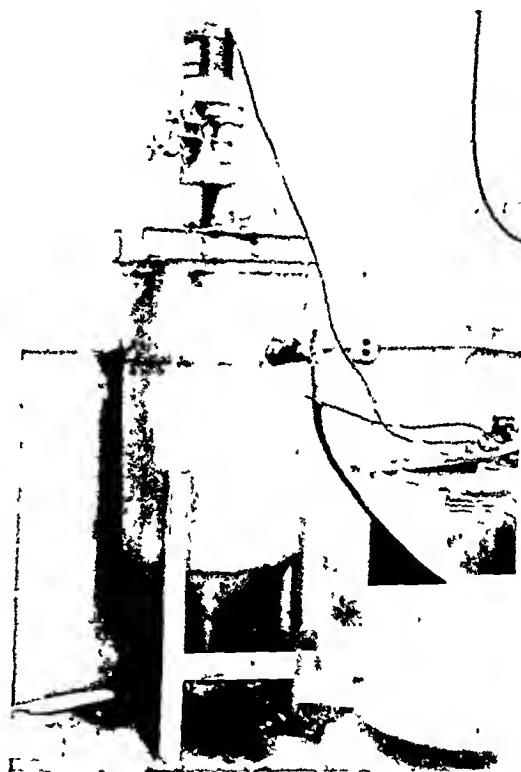
Invention Reduces Fluoridation Cost

A device which will lower the cost of adding fluoride to city water supplies has been developed by two Public Health Service scientists.

The new dissolver makes it possible to use fluor spar, the most inexpensive form of fluoride, which is used in preventing tooth decay. The cost per pound of fluoride ion in fluor spar is 4.3 cents. The cost per pound of fluoride ion in other compounds used in fluoridation ranges from 41.5 cents for hydrofluosilicic acid to 12.5 cents for silicofluoride. In the larger cities, the use of fluor spar can mean substantial savings; the estimated cut in costs for Washington, D. C., for example, is about \$50,000 annually.

The apparatus was developed by F. J. Maier, sanitary engineer director, and E. Bellack, both of the Division of Dental Public Health of the Public Health Service. Six months of testing preceded release of the device.

Previously, fluor spar was impractical for use in water supplies, because it does not dissolve readily. When this compound is used in the tanklike dissolver, an alum solution is fed into the device and an agitator keeps the fluor spar in suspension to help the dissolving process. The resulting



solution is drawn off and fed into the water system.

Manufacture of the equipment by private industry is expected to begin in the near future.

Age Differential in Medical Spending

By SELMA MUSHKIN

Out-of-pocket medical care expenditures of the urban population averaged \$65 per person in 1950, a relatively small sum when considered in relation to the average city family income after taxes of about \$4,000. Unlike most other items of consumer expenditures, however, medical care costs, in the absence of insurance coverage, are neither regularly recurring annual charges nor postponable expenses like those for such hard goods as automobiles or television sets.

In a single year, a relatively small number of persons incur a large part of the Nation's private medical care bill. More than 65 percent of all urban residents spent less than \$50 for medical care in 1950. At the other extreme, 7 percent spent \$200 or more, and their expenditures accounted for 41 cents of each \$1 of the private medical care bill in cities. Only one-fourth of 1 percent of all urban residents spent \$1,000 or more for medical care, but their expenditures represented 6 cents of each \$1 of private spending for medical care in cities.

. . .

THE PATTERN of spending for medical care differs markedly among age groups. A large part of the medical expenditures for children is composed of small annual bills, whereas the major part of the medical care spending of the middle and older age groups is attributable to the large bills of a relatively few who become disabled or seriously ill.

Information on medical care expenditures was derived from a Public Health Service tabulation of schedules obtained by the Bureau of Labor Statistics in its survey of consumer ex-

penditures for 1950. In this survey, Bureau of Labor Statistics interviewers visited 15,180 dwellings in 91 cities during 1950 and 1951. As a result, complete and useful information was obtained for approximately 12,500 families. The Bureau reports that "the expenditure data from this survey appear to be the most comprehensive and reliable ever collected by the Bureau in its long experience in this field dating back to 1889" (1).

Preliminary tabulations from the Bureau of Labor Statistics survey were released in revised form in 1953 (1). Extensive analytical tabulations of the data were published for the first time in 1956 as a joint project of the Wharton School of Finance and Commerce of the University of Pennsylvania and the Bureau of Labor Statistics, financed in part by a Ford Foundation grant (2). The 1956 reports include a considerable volume of material on medical care expenditures in relation to family income, together with information on urban spending for food, clothing, housing, recreation, and other components of consumer purchases.

In the several reports on the survey, the sampling methods used to collect the information, including the selection of the 91 cities, the selection of the dwelling units in these cities, and the factors determining the size of the sample in each city, are described in detail (1, 2). The building up of nationwide urban estimates from the sample cities is also described in a published report (3). Work is still being done, by the Bureau, by the Wharton School, and by students of consumer income and expenditures, on evaluation of the distribution and aggregates of income, savings, and expenditures estimated from the survey findings (4).

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A considerable amount of the information obtained from the families on medical care costs and utilization of health services was not processed in the joint Bureau of Labor Statistics-Wharton School project. In fact, much of the detailed medical care information was not coded. Accordingly, the Public Health Service has undertaken a special study of consumer expenditures for medical care from a random subsample of the interviews. In this study, attention has been directed to (a) the composition and characteristics of the larger medical care bills, (b) the types of free medical services received by individuals in different economic circumstances, and (c) the variations in spending for medical care among different age groups. This paper presents the findings on age variations in spending.

Study Methods

In selecting the subsample, the interview schedules were stratified by the amount of medical care expenditures. The subsample included all schedules reporting expenditures of \$1,000 or more, 50 percent of those reporting \$100 to \$1,000, 20 percent of those reporting \$200 to \$400, and 10 percent of those reporting some medical care expenditures but in amounts less than \$200. To provide a basis for evaluating medical care received by public beneficiaries, such as public assistance recipients, 50 percent of the schedules reporting no medical care expenditures were also included in the subsample. In all, 2,414 consumer units and 7,639 persons were included in the subsample out of the total of 12,489 consumer units interviewed by the Bureau of Labor Statistics. A comparison of the subsample with the whole sample showed that the two corresponded very closely in the family averages for medical care spending in each of the medical expenditure intervals.

Schedules selected from the tabulation which listed schedule numbers by amount of medical care outlay were pulled from each of the city schedule files. Transcripts were then made of the information reported by the family on medical care costs and family income. Information was transcribed separately for each member of the family unit on a family sheet, and hand tabulations were made from these

family sheets. The items of medical care expense covered in the survey are given on page 119.

The figures derived from the tabulations were weighted first to adjust for the subsampling ratio and then by the regional weights developed by the Bureau of Labor Statistics for each type of city, that is, large cities, suburbs, and small cities in each of three regions of the Nation, the north, the south, and the west. The total urban population represented by the survey sample was estimated by the Bureau of Labor Statistics to be approximately 95.6 million for the year 1950.

The study findings on age differentials necessarily reflect considerable error in the reporting of information by the family respondent, in sampling, and in estimation of aggregates from tabulated data. The total dollar volume of medical care expenditures is a computed amount, estimated by applying the midpoint of each of the dollar class intervals to the estimated number of persons in each age group spending amounts within these class intervals. For the open-end expense class, \$1,000 and over, the tabulated average expense figure for the sample in each region was used instead of a midpoint.

Average Spending

Various surveys of hospital and physician services suggest a considerable variation in utilization of medical services by age. They suggest, for example, that the aged as a group use roughly 1.5 to 2 times as many days of hospitalization and 1.5 to 2.5 times as many physician services as all age groups in the civilian population (5).

There are marked differences also in out-of-pocket medical care expenditures by age (table 1). Although urban residents under 19 years of age spend half as much as the average urban resident for medical care, those 65 and over spend 28 percent more than the average.

Three out of each 10 persons living in cities are under 19 years of age, but about one-sixth of the amount spent for medical care is spent for these children. Aged persons in cities represent 8.1 percent of the urban population as

Table 1. Average out-of-pocket medical care expenditures per person, by age group, urban population, 1950

| Age group | Average annual out-of-pocket medical expenses ¹ | Percent of average expenditures of all age groups |
|---------------------|--|---|
| All age groups..... | \$65 | 100 |
| Under 6..... | 29 | 44 |
| 6-18..... | 35 | 54 |
| 19-44..... | 72 | 111 |
| 45-64..... | 93 | 142 |
| 65-74..... | 87 | 134 |
| 75 and over..... | 76 | 118 |

¹ Amounts are adjusted to the \$65 average expenditure for all age groups as computed by dividing the Bureau of Labor Statistics total medical care expenditures for all urban families by the Bureau of Labor Statistics estimate of urban population.

Table 2. Percentage distribution of urban population and of urban out-of-pocket medical care expenditures, by age group, 1950

| Age group | Percent urban population | | Percent out-of-pocket medical expenditures |
|---------------------|--------------------------|-------------------------------|--|
| | In sample | In United States ¹ | |
| All age groups..... | 100.0 | 100.0 | 100.0 |
| Under 6..... | 12.7 | 11.9 | 5.6 |
| 6-18..... | 19.1 | 17.6 | 10.3 |
| 19-44..... | 38.3 | 41.1 | 42.7 |
| 45-64..... | 21.3 | 21.3 | 30.3 |
| 65-74..... | 5.8 | 5.6 | 7.8 |
| 75 and over..... | 2.8 | 2.5 | 3.3 |

¹ 1950 Census.

of 1950, but their medical care bills account for about 11 percent of the total (table 2).

Skewed Distribution of Spending

Averages are a peculiarly inappropriate base for evaluating consumer medical care expenditures. The skewed distribution of amounts spent by the urban population for medical care is shown in table 3. The figures reflect whatever leveling effect has developed out of coverage under voluntary health insurance since premiums are counted as part of ex-

pensitures while benefits received are excluded. A sizable proportion of medical care expenditures represents the spending of the small proportion of urban people with large medical bills.

The uneven distribution of medical care outlays is especially characteristic of the older age groups. About 8 percent of urban residents 19-44 years of age spend \$200 or more a year, but these persons spend 39 percent of the total spent by this age group. At ages 45-64, 11 percent of urban people spend \$200 or more, but their expenditures account for over half the spending for the age group. At ages 65-74 and 75 and over, 9 to 10 percent of urban people spend \$200 and over a year, and their expenditures account for 51 and 57 percent, respectively, of the medical care costs attributable to each of the age groups (tables 4 and 5).

The medical care spending pattern for children is considerably different from that for other age groups. A heavy concentration of expenditures in the large bills of a relatively small proportion of consumers has been noted repeatedly in the past as characteristic of family medical care spending and is indicated here for people 19 years of age and over. Expenditures for children, however, are largely concentrated in small annual charges. More than \$7 out of each \$10 spent for children under 6 is in amounts less than \$100, and fully one-half of the expenditure for children is in amounts less than \$50. In the age group 6-18

Table 3. Percentage distribution of persons and of total out-of-pocket medical care expenditures, by amount of medical care expenditures, urban population, 1950

| Out-of-pocket medical care expenditures | Percent of persons | Percent of total medical care expenditures |
|---|--------------------|--|
| All urban consumers..... | 100.0 | 100.0 |
| None..... | 17.4 | ----- |
| \$1-\$49.99..... | 47.9 | 17.4 |
| \$50-\$99.99..... | 17.5 | 19.1 |
| \$100-\$199.99..... | 10.2 | 22.2 |
| \$200-\$299.99..... | 3.7 | 13.3 |
| \$300-\$499.99..... | 2.1 | 12.1 |
| \$500-\$999.99..... | 1.0 | 9.8 |
| \$1,000 and over..... | .2 | 6.1 |

Table 4. Percentage distribution of persons in each age group by amount of medical care expenditures, urban population, 1950

| Out-of-pocket medical care expenditures | Age group | | | | | |
|---|-----------|-------|-------|-------|-------|-------------|
| | Under 6 | 6-18 | 19-44 | 45-64 | 65-74 | 75 and over |
| All urban consumers | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| None | 25.7 | 26.3 | 11.4 | 12.8 | 19.2 | 30.7 |
| \$1-\$49.99 | 61.3 | 55.8 | 46.3 | 39.1 | 41.3 | 37.2 |
| \$50-\$99.99 | 9.0 | 11.3 | 21.5 | 23.1 | 12.9 | 11.6 |
| \$100-\$199.99 | 2.9 | 1.3 | 12.5 | 13.8 | 16.7 | 11.4 |
| \$200-\$299.99 | (0.6) | 1.5 | 1.7 | 5.6 | 3.8 | (2.8) |
| \$300-\$499.99 | (0.4) | (0.6) | 2.5 | 2.8 | 4.2 | (4.1) |
| \$500 and over | (0.1) | (0.2) | 1.1 | 2.8 | (1.9) | (2.2) |

NOTE: Figures are shown in parentheses when the product of the percentages and the unweighted count of persons in the sample in the given age group is less than 10.

years, \$6 out of each \$10 spent is in amounts less than \$100. In part, the difference in the pattern of medical care expenditures by age reflects variations in sickness experience by age. The incidence of acute illness is higher among children than among older age groups, whereas the incidence of chronic illness is higher among older age groups than among children (6, 7).

Health Information Foundation Study

While the Public Health Service study of medical care costs was in process, the Health Information Foundation published its findings from a 1952-53 survey of family medical costs and voluntary health insurance (8). Differ-

ences in definition of medical care expenditures, survey design and scope, and dates of the interviews, as well as differences in age grouping make direct comparison of the two sets of findings difficult. Health Information Foundation data are for a later period and include the rural population; the Public Health Service study related exclusively to the urban population and covered 1950 expenditures. However, the similarities and variations in findings are of considerable interest and at points suggest questions which warrant further study and analysis. These two studies are the first to provide nationwide information on medical care costs by age since the 1928-33 studies of the Committee on Costs of Medical Care. The many changes that have taken place since this

Table 5. Percentage distribution of medical care expenditures of each age group by amount of medical care expenditures, urban population, 1950

| Out-of-pocket medical care expenditures | Age group | | | | | |
|---|-----------|-------|-------|-------|--------|-------------|
| | Under 6 | 6-18 | 19-44 | 45-64 | 65-74 | 75 and over |
| All urban expenditures | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| \$1-\$49.99 | 50.2 | 37.7 | 15.1 | 10.0 | 11.2 | 11.5 |
| \$50-\$99.99 | 22.2 | 22.9 | 21.1 | 17.7 | 10.6 | 10.8 |
| \$100-\$199.99 | 14.0 | 17.3 | 24.4 | 21.0 | 27.2 | 21.2 |
| \$200-\$299.99 | (1.8) | 10.1 | 15.3 | 14.3 | 10.3 | (8.5) |
| \$300-\$499.99 | (4.6) | (6.5) | 13.1 | 11.5 | 18.4 | (20.1) |
| \$500 and over | (4.2) | (5.5) | 11.0 | 25.5 | (22.3) | (27.9) |

NOTE: Figures are shown in parentheses when the product of the percentages and the unweighted count of persons in the sample in the given age group is less than 10.

committee made its survey indicate considerable caution in using its data as a basis for appraising present-day medical expense patterns.

The HIF study reports \$65 as the average gross charge for medical care per person in the total civilian population for 1952-53. This is exactly the same amount as the PHS study found for the urban population in 1950.

Average gross charges for children under 6 years of age are reported at \$28 and for children 6-17 at \$38 in the HIF study. Out-of-pocket expenses for children under 6 are estimated at \$29 from the PHS study; out-of-pocket expenses for those 6-18, at \$35. There is a similar close correspondence of the figures for persons in the adult ages, except that the HIF figures suggest a larger increase in expenditures for persons 65 years of age and over than is indicated by the PHS study. The HIF

study shows a \$102 average gross charge per person 65 and over; the PHS study indicates out-of-pocket costs of \$83 per person 65 and over.

In part, the difference for the 65-and-over age group is attributable to the difference between gross charges and out-of-pocket medical care expense. Gross charges as defined in the Health Information Foundation study include amounts paid out for physician, hospital, dental, and other medical care services and for services received as insurance benefits. Out-of-pocket medical expense in the Public Health Service study does not include services received as insurance benefits but includes health insurance premiums paid. Benefits received by older people may exceed their own health insurance premiums. To the extent that this is so, health insurance may serve at present to spread the risk among age groups in the covered

Definition of Medical Care Expenditures

Medical care expense is defined in the Bureau of Labor Statistics study to include health insurance premiums paid by the family, medical expense incurred in cases of illness (other than expense covered by an insurance plan), and expenses for such items as routine physical and dental examinations and nonprescription drugs. Expenses were reported for care received during 1950 even though payments were not made until after the close of the year.

The family member interviewed was asked to report expenses for each of the following items of medical care for each family member:

Premiums. Premiums for 1950 for hospitalization, surgical, and medical service plans; premiums for 1950 for disability, health, and accident insurance.

Expenses while hospitalized. Room or ward; physician, specialist, and surgeon services; nursing services; all other charges for hospitalization (including laboratory tests, X-rays, etc.); ambulance services; combined bills (if separate items not shown).

Other medical care expenses. Physician, specialist, and surgeon services; dental care; chiropractor, faith healer, etc.; oculist, optometrist, eye

glasses, etc.; laboratory tests (other than in connection with hospitalized illness); X-rays (other than in connection with hospitalized illness); nursing care at home; prescription and nonprescription drugs and medicines; appliances and supplies; other medical care expenses.

A single expense figure was reported on some schedules for the entire family. Typically, expenditures for drugs and those premiums paid for family insurance coverage were reported in this way. For the present study, allocations were made to individual family members on the basis of the interviewer's notes when such notes indicated an appropriate basis for apportionment to individuals. In other instances, drug expenditures were apportioned equally among family members, and insurance premiums were apportioned among the family members covered in accordance with the usual practice in insurance plans of differentiating premiums for individual and for family membership without scaling premiums to family size. Premiums were allocated in equal sums among family members 18 years of age and over covered by a single premium payment.

population, and benefits added to direct personal expenditures may be larger for the older age groups than their own out-of-pocket payments, including health insurance premiums paid.

Comparison of the distribution of persons by amount of charges also indicates a general similarity in the findings of the two studies. The proportion of persons with bills of \$200 or more, for example, is 7 percent in the PIHS study, and the proportion with bills of \$195 or more is 8 percent in the IHF study. The IHF study consistently reports a larger proportion with "no charges" than the PIHS study, but again the difference may be largely the result of differences in definition of medical costs. The former study relates exclusively to medical costs paid by the family or by the insurance plan; the latter includes premiums paid for protection, with the result that persons who receive no medical services but prepay for future expenses are reported as making an out-of-pocket expenditure for medical care.

Need for Additional Information

The information on medical charges of individuals was compiled by the Health Information Foundation as a part of a study principally concerned with the distribution of costs for personal health services among families and the effect of voluntary health insurance in spreading the costs. The Bureau of Labor Statistics recorded information on medical care spending for individual family members largely to improve the reporting of total family expenditures. Although the family unit is of considerable importance in assessing the economic burdens of medical care, data on spending of individuals are needed for many purposes and by many groups such as health insurance carriers concerned with planning medical care benefit and coverage programs. In develop-

ing additional studies on the economics of medical care, it would appear desirable to plan the collection of information about the medical care spending habits of individuals and to broaden the scope of knowledge about the variations in medical care expenses by age especially in relation to differences in sickness experience.

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What Public Health Nurses Like About Their Jobs

By WINIFRED KELLOGG, R.N., B.S., M.P.H.

PUBLIC HEALTH NURSES like the broad scope and variety of work that is public health nursing—the opportunity nursing gives for contact with all kinds of people, the challenge represented in the needs discovered, the satisfaction inherent in accomplishment, the stimulus to personal and professional growth.

Public health nurses leave their jobs for personal and family reasons, for more schooling and broader experience. They think of leaving their jobs when they are dissatisfied with supervision, administration, and personnel policies. Many stay, in spite of dissatisfaction, because of pension plans and for personal reasons.

Public health nurses who like their jobs are the most effective recruitment agents. Public health nurses with major dissatisfactions that are misunderstood or ignored dissipate their energies in tensions and function at a low level of efficiency. Their dissatisfaction is apparent to others. It may have an important bearing on the decreasing ratio of public health nurses to population.

These are conclusions from a recent survey of public health nursing in Michigan, described below.

Because more public health nurses are needed in Michigan, the department of public health nursing of the Michigan League for Nursing

in 1954 conducted a job satisfaction study for public health nursing similar to that for hospital, industrial, and office nursing in the Cunningham Drug Foundation survey of nursing needs and resources in Michigan. The purpose was to find the best means of recruiting nurses and of keeping active those who now are public health nurses.

The questionnaire used in the Cunningham job satisfaction survey was revised to make it applicable to public health nursing. Guidance in preparing the questionnaire was obtained from research specialists of the University of Michigan School of Public Health and from the Michigan Department of Health. Two hundred seventy-five questionnaires were sent to a random sampling of nurses employed in service agencies: one questionnaire was sent to every third nurse on the Michigan Department of Health list. One hundred sixty, more than half of the questionnaires, were returned: 126 by staff nurses, 34 by directors and supervisors.

Respondents included from 15 to 30 percent of all nurses employed in each type of agency and represented all parts of the State. They ranged in age from under 25 to over 55; in public health nursing experience, from less than 6 months to more than 30 years; in education, from no college attendance to graduate degrees; and, in public health nursing theory, from no instruction to more than 1 year.

Respondents were asked how they became aware of public health nursing vacancies, why they entered public health nursing, why they chose their jobs, what they liked and disliked about their jobs, whether they planned to

Miss Kellogg is president of the Michigan League for Nursing, Lansing. Since 1951 she has been assistant director of the Visiting Nurse Association of Detroit, and from 1937 to 1950 she was educational director of the association.

change and why, and what they planned to do if they changed. The variety of answers were studied, coded, and tabulated. Many respondents gave more than one answer to a question, and when they did not evaluate the relative importance of their answers all of those which could be coded were tabulated.

Here is a brief summary of their most frequently repeated answers, a few quotations, and some generalizations based upon their remarks.

Why public health nurses leave their jobs

Fifteen respondents had plans to leave their jobs, and an additional 20 were thinking of leaving. Nine of the thirty-five gave personal or family interests as reasons for their leaving. Six were planning to go to school. Thus, 9 percent of the total respondents were thinking of leaving their jobs for reasons which were unrelated to job satisfaction.

The remaining 20 who were thinking of leaving, or 13 percent of the total respondents, expressed great dissatisfaction regarding their jobs.

Sixteen were dissatisfied with factors coded under "supervision" or "administration." Twelve of these were staff nurses; 4 were supervisors or administrators. Six of the 16 complained of personal relationships, 5 of work pressure, 5 of supervision. One, a graduate of less than 6 months from a basic degree program, said that she was "stagnated taking care of the chronically ill." One supervisor was not sure of her ability to supervise.

Seven listed factors which coded under "personnel policies" as important to their decision to leave their jobs. Three of the seven mentioned "administration" too and are included in the 16 reported above. One respondent, in complaining of her inadequate salary said: "The satisfaction of saving humanity doesn't always fill the gaps." Salaries and reimbursement for travel were most important; vacations and leave policies were mentioned.

What public health nurses dislike

Public health nurses dislike work pressure that inhibits effectiveness. They are especially unhappy when they believe that such pressure

results from confusion, duplication of effort, a lack of administrative planning, and uncertainty regarding job responsibility. They dislike interpersonal relationships that are not based upon mutual respect for all. They dislike supervision that restricts development or fails to aid in growth. They dislike time-consuming activities which they believe do not require public health nursing skills. They dislike working where salaries and reimbursement for travel are inadequate, and where vacation and leave policies are restrictive.

Fifty-eight respondents (36 percent of the total) either gave no answer or said that there was nothing they disliked. Thirty-seven staff and 17 supervisors (34 percent of the total) listed factors related to supervision and administration as a major source of dissatisfaction.

Work pressure was most frequently mentioned. Eight staff nurses and five supervisors related this entirely to staff shortages. The supervisors indicated that there was "just no way to get the work done" even though they put in a great deal of their own personal time. Four staff nurses and three supervisors related work pressure to lack of administrative planning; to new projects being started before those under way were completed; to too many department heads and too few staff workers; to difficult relationships between individuals and divisions; to confusion and duplication; to uncertainty regarding job responsibility; and to a need for more definite written policies.

Interpersonal relationships were mentioned as a source of dissatisfaction by 19 staff nurses; supervision was a dissatisfaction for 8. Two complained because they had no supervision. Two complained because their supervisors lacked information regarding the community and made no effort to learn. One said that conferences following field supervision were delayed too long. Three complained that they could not exercise initiative or were required to follow routines too closely. Poor utilization of time was a source of dissatisfaction to three. Fatigue resulting from transporting children to clinics, dislike of truancy work, preoccupation with work that could be done by a secretary or clerk were mentioned.

Twenty-three percent of the respondents dis-

like records and reports: Thirty staff nurses and six supervisors listed preparing records and reports as the part of their job they disliked most. Seven of the thirty-six complained of other things in addition to records. Only one mentioned work pressure. Some related dislike to a lack of adequate clerical staff. The highest percentage of dislike of records was among those with the least education. There was a lower percentage of dislike among nurses who had been with the agency for more than 5 years.

Ten percent dislike environmental factors. Travel conditions, unsatisfactory office space and equipment, and inadequate community resources were mentioned. Six percent dislike personnel policies. Salaries and reimbursement for travel were first in importance, vacation and leave policies next.

What nurses like about their jobs

One hundred thirty-one individuals (82 percent of the total) said that they like the type of work they do. That is, they like working with children, with families, with community groups, with young staff and students. They like to see people get well; they like to help people stay well; they like the satisfaction of knowing they have helped. Nineteen percent mentioned factors related to supervision and administration—such things as good personal relationships, freedom to plan, opportunity to use initiative, lack of tension, pleasant working conditions, opportunity for professional growth. Fifteen percent mentioned policies regarding education, advancement, hours of work, and salaries. Only three of these individuals mentioned salaries.

Public health nurses like their jobs when they are able to see that their work is effective; when they have the guidance needed for growth and the freedom to exercise initiative in accordance with ability; when policy is clearly and flexibly applied to allow for individual and circumstantial differences; when interpersonal and interdivisional relationships are good; when lines of communication are clear; and when administration has a realistic understanding of what is involved in getting a large volume of work done.

Why nurses take specific jobs

Nurses take jobs in specific agencies located near family or friends or near educational and cultural institutions. They take jobs in specific agencies when through agency personnel or field work they learn that the agency is a "good place to work," offering opportunities for growth and job satisfaction, and that personnel policies and personal relationships are good.

Forty-seven percent of the respondents chose jobs so they could be near families, friends, or educational and cultural facilities. Thirty-four percent chose jobs because of the broad scope of the job or the type of work. Twenty-four percent were influenced by contact with public health nursing personnel and others who knew about the work. Twenty-three percent gave reasons which coded under "personnel policies." Sick leave policies were mentioned several times.

Why they take public health jobs

Forty-nine percent of the respondents said in a variety of ways that they entered the field of public health because they were interested in people, liked children, liked working with families, liked school work, or liked community work. Their replies were coded under "broad scope of the work." Contact with public health nurses and others who knew about the work influenced the decision of 42 percent of the respondents. Experiences during basic nursing and field work were frequently mentioned. Personnel policies were important to 25 percent; specifically mentioned were hours of work and policies regarding education, advancement, and salaries. Job exploration was mentioned by 18 percent of the respondents.

How nurses learned about vacancies

Nurses enter the field of public health when through contact with public health nurses and others who know about the work, they become aware of the opportunities and challenges it presents.

Two-thirds of the respondents learned about their jobs from staff or board members, relatives, friends, physicians, or field work in the

agency. Very few learned about their jobs from such sources as professional journals and employment agencies.

Plans about changing jobs

Of the 29 nurses who were thinking of leaving their jobs, exclusive of those who were going to school, 1 will probably not leave, 7 will take other public health nursing jobs in Michigan, 9 will take public health nursing jobs in other States, 5 will enter a different field of nursing, and 4 will leave nursing altogether.

The four who said they would leave nursing were staff nurses, and all were married. Two were leaving for personal reasons and two because of work pressure, personal relationships, and the wrong kind of supervision.

The percentage of respondents who were planning to leave their jobs was highest in those under 25 and lowest in those over 55.

Unfinished business

Nurses in all types of agencies expressed major dissatisfaction regarding certain aspects of their jobs. There is no possible way to judge the validity of respondents' complaints. Administrative and supervisory practice may not be as bad as some think, but as long as that thought remains, the agency and each individual in it has a problem. Certain it is, there is room for improvement. The administrator, supervisor, or staff nurse who disclaims responsibility in the situation is apt to be the very one who most needs to take it seriously. Dissatisfaction when properly understood and utilized may serve as stimulus to improvement.

Many studies have been made in Michigan and throughout the country. Too frequently, reports are compiled and filed for future discard. We hope to do better with our job satisfaction study. Though we acquired little new information, we do believe that our findings are significant, and we intend to use them as a stimulus to improvement. We believe they have value too for other States.

A brief mimeographed report of the study, which is essentially the same as the foregoing findings, was printed in April 1955 and distributed to nursing agencies by the public health

nursing section of the Michigan Department of Health. Accompanying the report was a list of questions to consider in analyzing their own situation.

Questions for consideration

The list of questions distributed with the job satisfaction report is reproduced below:

1. Which of the findings reported here are true for your agency?

2. Are staff and board members aware of their potential strength as recruitment agents? How can such awareness be stimulated and utilized?

3. Do field staff and board members have access to application forms, personnel policy outlines, and promotional materials? Do they make use of them?

4. Are board and committee members and others in the community aware of the tremendously satisfying aspects of the public health nursing job? Can these people be made aware of this factor so that they will talk of it among their friends and relatives, some of whom may happen to be nurses?

5. Are staff members utilizing the educational and cultural facilities of the community in their own personal development? If such facilities are inadequate, could more adequate resources be created and developed?

6. Do all staff members understand supervisory and administrative processes? Are communication lines clear? Do the field staff, supervisors, and junior administrators have some freedom to make professional decisions and exercise initiative?

7. When administrators decide to embark upon a new program, do they either add staff or cut the established program to make time for the new? Do they consider clerical as well as other needs?

8. How can specialized division heads keep themselves and each other aware of the pressures created by their demands upon generalized supervisors and staff?

9. What can be done to help nurses with records and reports? Is adequate clerical help provided? If full-time clerical help is either not needed or not available, has an attempt been made to find part-time workers? Do nurses

have adequate space and a quiet time for doing clerical work? Are they given an adequate introduction to recordkeeping? Do they need courses in rhetoric? Is information requested that is not essential? Are field nurses aware of uses made of statistical information collected?

10. Are personnel policies at least up to the minimum standard recommended by the profes-

sional nurses' association in your community? How satisfactory are the policies about salaries, mileage rates for the use of personal cars, working hours, vacation, and leave? Can an employee who has served for many years get a 1- to 3-month leave of absence, other than for schooling, without loss of seniority or civil service status?

Program for Evaluating Heart Disease Drugs

A grant of \$575,000 to evaluate the effectiveness of drugs used in heart disease treatment was awarded Dr. Alan E. Treloar, director of research of the American Hospital Association.

The research grant, the largest of its kind ever made by the National Heart Institute of the Public Health Service, will finance a nationwide program coordinating the work of a number of research teams, as yet to be selected.

The projected large-scale study involves a testing program to determine the most effective drugs, or combinations of drugs, and dosages among the many new forms of treatment developing in the heart field. Initial emphasis will be on hypertension.

Dr. Treloar and the American Hospital Association envision the formation of an advisory board to set up the program's guiding principles and to make broad policy decisions. The board will be composed of eminent medical research workers and clinicians; it is expected to include a representative of an appropriate committee of the American Medical Association and also of the American Heart Association.

A central staff located in Chicago will include a clinician and a biostatistician who will coordinate project activities and supply administrative and biostatistical services for investigators. Each hospital and clinical research laboratory collaborating in the program will provide a representative for a technical committee. This group will serve as a means for constant communication between the research teams and will determine details of procedure.



The San Juan Basin Plan

By GEORGE MOORE, M.D., M.P.H.

IN THE EVENT of a national emergency from enemy attack, the small cities, towns, and villages of America will save the populations of many of the larger industrial cities. This statement cannot be questioned since the primary targets in the United States include most large cities with their factories and congested populations. How can the small cities and towns in rural areas save their urban neighbors? The San Juan Basin of Colorado has attempted to provide an answer.

Some 33,000 people live in the San Juan Basin, a four-corner, 12,000-square-mile area flanked by the high mountain ranges of the Rockies. The basin is central to Albuquerque

in New Mexico, to Phoenix in Arizona, to Salt Lake City in Utah, and to Denver and Pueblo in Colorado. Distances to these cities range from 200 to 500 miles. Most east-west and north-south highways in this region of the southwest converge on Durango and Cortez, Colo., the basin's largest communities. Durango has a population of 12,000, Cortez, 5,000.

In the event of enemy attack, no target in the basin would be worthy of enemy bombs, but dangers do exist. Radioactive fallout from the bombed cities may drift over the basin. Enemy saboteurs may plot destruction of vital installations. Thousands of evacuees may seek refuge in our homes and hospitals.

The danger of radioactive fallout has been met by establishing in Durango, at a cost of about \$1,000, a detection station that houses a Staplex single-volume air sampler. Manned by a team of health department personnel, the instrument is capable of detecting minute amounts of radioactivity in the air before the danger becomes serious, thus providing hours of warning. It operates on 110-volt current or by a generator.

A weather bureau official computes the fallout patterns and relays his findings to our radio

Dr. Moore, director of the San Juan Basin Health Unit, Durango, Colo., is one of three physicians appointed by the San Juan Basin Medical Society to plan for medical care in an areawide emergency. An account of Dr. Moore's experience as chief public health officer, United States Operations Mission to Nepal, 1952 to 1954, appeared in the April 1954 issue of Public Health Reports, p. 340.

station for Conelrad broadcasts on 640 and 1240 AM frequencies. If, after an attack, the team should find that fallout is a serious hazard, civil defense officials could confidently call for withdrawal toward a safer area. Mass evacuation of the basin's families can thus be a leisurely and simple procedure.

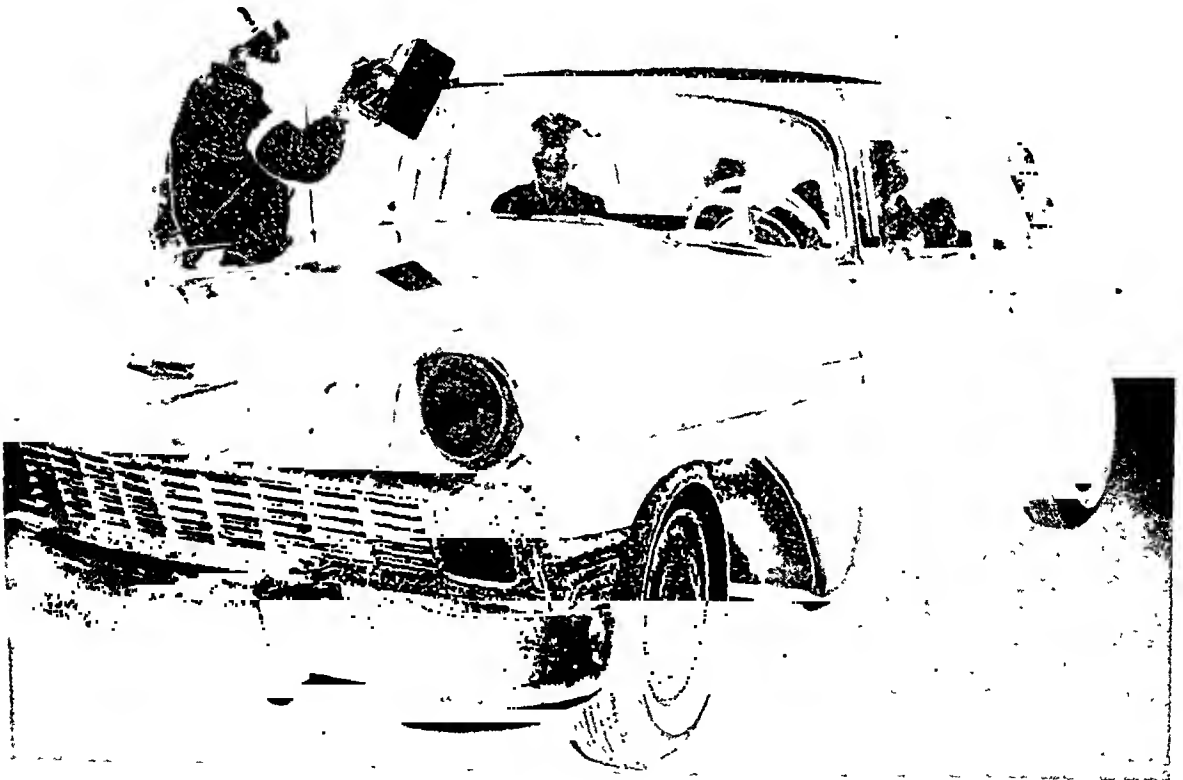
As to the second danger, we can expect that one-way bombers after their bombing runs from the north might land on the flat mesas and prairies of central and southwest States. We can also reasonably expect that airmen conversant with American customs and perhaps trained in sabotage will enter cities and towns unnoticed and mingle with the populace. Their job would be to foment panic, to set fires in forests and lumberyards, to destroy

bridges, powerplants, and oil dumps, and to contaminate water and food supplies with chemical and bacteriological agents.

A third problem, fraught with danger too, is the extent of our preparedness to receive and care for evacuees. If a city such as Albuquerque with a population of 160,000 has at least 3 hours' warning, it is expected that about 150,000 persons could be evacuated. Possibly 20,000 or more refugees will find their way northward across the desert to the mountainous San Juan Basin.

Many of these evacuees, hungry, desperate, sick, and afraid, might conceivably ransack and loot stores, gasoline pumps, and food warehouses, leaving nothing for evacuees or residents alike. And without further food and

for Small City Survival





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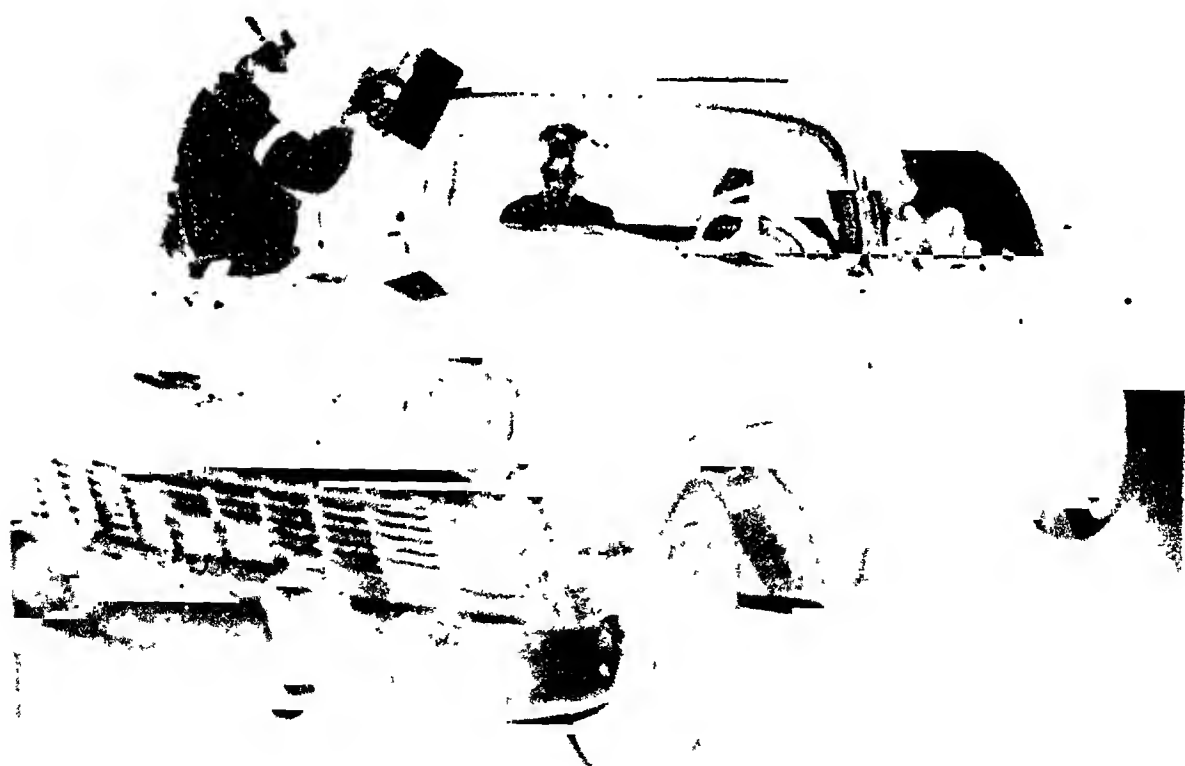
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for Small City Survival



stores for 3 weeks or more, the basin's inhabitants would themselves become victims of war. Therefore, an orderly reception of evacuees is necessary to insure help and rapid recovery for all.

The Fortress City

The survival plan is for Durango to consider itself a fortress in time of attack. At the flash of national alert, the city will go under civil defense authority, similar to martial law in many respects. All emergency teams will proceed to their stations.

Main highways leading into Durango will be barricaded with bulldozers and trucks, leaving detour routes around the city open for outside traffic as needed. All traffic within the city, except emergency and official vehicles, will be stopped. Places of business and service stations will be closed. Armed guards will be posted in front of food stores to prevent runs on supplies. School children will be sent home immediately. People will be warned to stay in their homes.

Thus, the city will be ready for attack, teams will be at their posts, and residents and workers will be at home waiting for Conelrad reports on their radios. In this period of waiting the public will ready their cars, fill tanks with stored supplies of gasoline, draw off water for storage, and prepare baskets of food. Conelrad in cooperation with the detection station will advise of fallout from bombed areas. If mass evacuation of the city is necessary, Conelrad will describe the routes to designated rendezvous points.

Reception of Evacuees

When the first evacuees arrive at Durango, they will be met at the roadblocks by the traffic control teams. If they prefer to detour the city, they will be offered a cup of coffee and a sandwich by a welfare team and then directed to follow the markers. Gas stations at each barricade will ration a few gallons of fuel, if needed, to each vehicle as long as the gasoline lasts.

For the 20,000 evacuees who prefer to stay in Durango, a different procedure is planned.

These individuals will be met at the barricades by monitoring teams who, with geiger counters and ionization chambers, will check for radioactive fallout dust. Vehicles found to be radioactive will be either left outside the barricade or motioned on toward the detour, as the occupants prefer. Vehicles found free from contamination are then screened by the police for saboteurs. Luggage and identification will be checked thoroughly before either a vehicle or person is permitted to pass the barrier. Arrangements have been made for the care of pets.

Each barricade will have a mobile first aid team led by a physician. The team will send injured and ill evacuees, by ambulance or truck, to one of three first aid centers temporarily established in the Durango public schools. The injured and sick will be treated at the first aid stations and then either transferred to a hospital or released to one of five registration centers. The healthy evacuees will be directed to a wide parking expanse where traffic teams will park the cars in an orderly fashion. Radios at the barricade will keep the teams informed of possible new dangers.



"Saboteur" found on public street by Durango police during simulated alert, July 1956.

At the parking lot, the evacuees, carrying their luggage, will board school buses waiting to shuttle them to the registration centers. The centers are to be located in public buildings central to each of five main sections in the city. They will be manned by volunteers and welfare officials. After registration, evacuees will be sent on foot, in company with boy scouts or uniformed guides, to their assigned quarters in the homes of residents. A list of available rooms is ready in anticipation of this maneuver.

In the interim, the fire department will have been waiting for emergency calls, and the police department will have stationed guards at bridges, gas depots, water works, and other vulnerable sites. Factories will have assigned men to guard industrial targets. The relative absence of street traffic will simplify the job of safeguarding people, homes, and key targets. Likewise, the detection of looters and saboteurs will be less difficult.

The next morning should see Durango intact with all evacuees received and placed. The care and conservation of what is left then begins.

Realistic Planning

A full count of evacuees and an inventory of food, clothing, gasoline, and medical supplies will determine how the city will live for the next few weeks. Health officials will check water and food for possible contamination and will try to maintain near normal services. Twice a day, volunteers and welfare and health personnel will set up food lines at the fairgrounds and at large restaurants.

For supplementary needs the granges have accumulated stores of extra supplies of canned food, fruit, potatoes, and gasoline. These will be rationed as needed. At any time, we could supply 25,000 to 30,000 pounds of milk, 25,000 head of beef cattle, 60,000 sheep, and 1,000 hogs. Flour, pinto beans, and grain are abundant. Food, therefore, should not be a problem.

If the watershed becomes contaminated with fallout, we would have enough stored water, once the reservoir is covered as planned for 1957, to last evacuees and residents 3 weeks. Water supplies have been tremendously improved this year over last by the addition of



Sheriff and civil defense aide find "bomb" under oil tank in Durango suburban area.

a new filter plant in Durango. Water during most of the year is plentiful. Most farms have wells, and water will be transported to the cities as needed. Our fast-flowing streams could in warm weather decontaminate most of the watershed within a week. Sewerage, though inadequate, also has top priority in city budgeting.

The police and firemen in Durango have been trained by former Army servicemen in many types of counter sabotage. The police and fire departments held an impressive operation alert in July 1956 together with civil defense teams, health department personnel, and amateur radio operators. The exercise simulated a realistic emergency complete with enemy agents plotting to contaminate water, incendiary fires ignited in army-type smoke pots, and time bombs planted at strategic sites (see pictures).

During an alert, auxiliary police will patrol the filter plant and reservoir, and our sanitation staff will stand by for any emergency. Continuous check will be made on the water for turbidity, changes in pH, presence of bacteriological agents, and deposits of radioactive fallout if it is a problem. The small laboratory of our health department and the technician in charge are well equipped and well qualified to make bacteriological examinations. We hope to acquire a millipore filter soon.

All of the health department staff have received special training in civil defense through courses in Denver and in Washington. They in turn have helped to train civil defense work-

ers in Durango (see program). The monitoring teams have been trained in food and water decontamination. The fluorescent antibody and phage tests for rapid bacteriological diagnosis as well as complete kits for CW (chemical warfare) sampling will be added to our program as soon as these materials are released. At present, public health defense against BW and CW attacks is not particularly effective until the specific agent is determined and after people are already sick and dying.

The San Juan Basin Health Unit now has a full year's determination of background counts on radioactive fallout. The Colorado State Health Department gave valuable assistance in calibrating the air sampler and in training health personnel in radiation detection. The weather bureau official who will chart and relay fallout reports was sent to the Sandia Corporation in New Mexico for special training.

Natural and Wartime Disasters

The survival plan will utilize every available inch of space in the hospitals as well as in auxiliary buildings. The only hospitals in the basin are the two hospitals in Durango and the hospital in Cortez. Altogether we count on having 300 hospital beds, 25 physicians, 6 dentists, 4 veterinarians, 185 first aid workers, and about 150 nurses and aides. All available nurses have been listed. If disaster strikes a nearby city, a team of 6 physicians with nurses and helpers and supplies is ready for call.

A move has been made to bring Federal Civil Defense Administration stockpiling to the basin because of the remoteness of the stockpiles in Texas and Utah and at Greeley, Colo. All hospitals are stockpiling medical supplies and rotating perishable items. Eventually, their stockpiles will hold a year's supply in advance.

Vaccines and serums are not being stockpiled to any great extent because it is not in our present plan to offer immunizations to the public at large. The health unit has been attempting to provide mass immunization through school programs. Immunization levels among school children are well over 85 percent for smallpox and diphtheria-pertussis-tetanus.

Civil Defense Training Course

San Juan Basin Health Unit

First Day

Strategic briefing of civil defense.

Effects of modern weapons. Films "Let's Face It" and "Operation Ivy."

Nuclear weapons and radiation detection instruments. Film "A Is For Atom."

Evaluation of radioactive fallout hazard.

Biomedical effects of radiation.

Chemical warfare.

Bacteriological warfare.

Films "Flash of Darkness" and "Target You."

Evening

Films "Atomic Attack" and "Frontline of Freedom."

Second Day

Civil defense analysis.

Attack warning. Film "Conelrad."

Civil defense organization.

Organization of health services, casualty care, health and medical supply program, and the improvised hospital.

Durango as a typical support area, urban analysis.

Evacuation, shelters, and cover. Films "Escape Route" and "Operation Welcome."

Rescue training. Film "Trapped."

Registration and warden services.

Police and traffic services.

In addition, the Indians in the basin are now protected with typhoid-paratyphoid vaccine.

We have tried to be realistic in planning for various types of casualties. In addition to screening evacuees for communicable disease, we have made specific provisions for isolation of disease suspects at first aid stations, for the use of churches and churchmen to help alleviate hysteria and panic, and for hospitals to set aside wards for radiation victims. Evacuees with burns, fractures, amputations, and other serious conditions are not expected in great numbers because of the basin's distance from target areas. They may be sent here later, however.

Of course, no one knows how many evacuees the basin might receive, but, for our planning, a total of 20,000 has seemed a practical number to assume. Durango, with new discoveries of oil, gas, and uranium, has become a boom town since the war. Housing is at a premium, and most new homes are ranch style and small. We would have trouble accepting more than 20,000 new people, but if we had no choice, we would use barns, rodeo facilities, and all available public buildings.

Considerable interest has been expressed in our plan. A mutual aid pact is being drawn up with Farmington, N. Mex., the first large city south on the road to Albuquerque. Farmington will detour evacuees to us as we will to them if cities to the north of Durango are bombed. Other cities in Colorado and New Mexico and even in South Dakota have shown interest in organizing similar programs. It

has been obvious that the public is worried about the future and will work enthusiastically if we lead the way and provide hope.

The basin also has an alternative emergency plan that covers the natural disasters any community might experience from train wrecks, fires, collapsed buildings, and flood. Not more than 50 casualties are expected from any one isolated incident. These we will care for by using the maximum available beds in the basin's hospitals. The hospitals are prepared, as needed, to reroute their patients and to provide morgues and extra dispensary space. Physicians have specific assignments.

Now that all phases of both plans are complete, we trust that the basin will be ready for whatever comes, natural and war disasters alike.

NOTE: The photographs were supplied through the courtesy of Pennington Studio, Durango, and the *Durango Herald News*.

idea

The Personal Touch

Though approximately 400 persons receive postgraduate training in public health every year, the profession is probably losing between 600 and 700. States fortunate enough to have a reasonable number of public health workers have usually obtained the greater proportion from adjoining areas.

Our replacement needs and the additional workers needed to meet the demands of a growing population have to be viewed realistically in the light of the decreased supply of young people, brought on by the reduced birth rate from 1930 to 1941, and of the many inducements that are currently offered to them.

Industry's profits at the moment are of such magnitude in relation to

the tax structure that industries can afford to pay salaries to professional personnel for beginning employment in ranges that industries themselves recognize are greater than the employee is actually worth.

Training for public health work, usually provided from public funds because it primarily benefits the employer, has declined appreciably because of cuts in Federal grant funds. Some States have been reluctant to finance training or have been unable by law to do so. Thus, the cost of preparation is devolving upon the individuals themselves even though financial compensation, when employed, does not compare favorably with that of industry.

Since competition for personnel is so keen, I would like to suggest that there is a common need for bringing to seventh, eighth, and ninth graders some concept of the many interesting things that can be done in public health work. I would encourage maximum sensitization of this

group through whatever channels you can use to reach them. Perhaps too few of us have thought about the influence we could have by working actively in such groups as the Boy Scouts and Girl Scouts and the Hi-Y and 4-H clubs.

The most effective recruitment program I have seen for getting young ladies into a nursing school was one in which each student was given the responsibility for seeking out some worthy successor from her former high school and giving her a pledge pin.

Our recruitment programs must be personalized if they are to be effective.

—**HARALD M. GRANING, M.D.**, regional medical director with the Public Health Service, Region 5, Chicago, in a speech at the annual meeting of the Middle States Public Health Association, Columbus, Ohio, April 30, 1956.

technical publications

Diabetes Program Guide

PHS Publication No. 566. 72 pages, 45 cents.

State and local workers in diabetes control activities will find in this compact guide a complete presentation of the principles and procedures of community diabetes programs, starting with community resources and proceeding through prevention to case finding, education, evaluation, and research.

Emphasis is placed on testing, with statistical and laboratory procedures treated in some detail.

Criteria of success in diabetes programs are stated as: finding unrecognized diabetics and following them to diagnosis and treatment; helping prevent or correct obesity; helping diabetics control their condition under medical supervision; promoting the understanding of diabetes through individual and group education; and mobilizing community resources.

Included are forms and form letters, seven pages of references, and a detailed section on the cost of screening, with data on both laboratory costs and personnel.

Your Child from One to Six

Children's Bureau Publication No. 30. Revised 1956. 110 pages; illustrated. 20 cents.

This revised bulletin for parents emphasizes the mental and emotional development of children from infancy to school age.

The problem of television viewing is discussed for the first time. Other new sections point out how a child can learn to do without its mother, how to prepare a child for hospitalization, and what to tell a child who asks about death.

A comprehensive medical section tells how to handle emergencies, how

to care for a sick child, and how to prevent and recognize illness. Also provided is a complete immunization plan for children from one month of age throughout childhood.

Public Health

Merit Badge Series No. 3251. 1956. Boy Scouts of America. 66 pages; illustrated. 25 cents.

A new version of this pamphlet has been prepared in association with the Public Health Service. Designed to help Boy Scouts qualify for a merit badge, it is also an elementary introduction to basic concepts and programs of the public health profession.

Sources of Morbidity Data. Listing Number 4. 1956

PHS Publication No. 564. 1956. 74 pages.

The fourth listing of projects in the files of the Clearinghouse on Current Morbidity Statistics Projects contains descriptions of 102 projects, supplementing the 477 described in Listings Nos. 1, 2, and 3 (PHS Publications Nos. 332, 399, and 459).

There are three indexes: the projects by type of data collection; the organizations and institutions participating in the projects, by State; and the principal investigators. Also included is a section of supplementary notes representing a systematic followup on projects in the previous listings that were in progress when their descriptions were received by the clearinghouse.

Because the listings of the clearinghouse are published primarily for the use of actual and potential contributors, the number of bound copies available for other distribu-

tion is limited. Tear sheets for all projects are on file, however, and these will be mailed free of charge to persons inquiring about studies of a particular type.

Federal Support for Science Students in Higher Education, 1954

National Science Foundation Publication No. 56-18. 33 pages. 39 cents.

Designed to assist in evaluating proposals for federally financed scholarships in the sciences, this report provides information on present Federal aid to college and university science students.

It shows how much of the expenditure (in the form of fellowships or otherwise) in each program went to students in the various scientific disciplines; how many career science students were assisted; which Federal agencies were involved; how the various forms of financial aid were distributed among those studying in scientific fields; and, how, among the fields of study at graduate level, the federally aided group of science students compares with the nationwide graduate student body in the sciences.

Data on students in nonscience fields are included in the aggregate only for comparison.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Film an Educational Aid In New Mexico's Venereal Disease Program

By BERNARD F. ROSENBLUM, M.D., M.P.H.,
and WILSON A. CORCORAN, B.A.

NEW MEXICO, in 1955, ranked sixth in reported cases of syphilis. For the young age groups, those aged 15 to 25 years, the significance of the venereal disease problem in the State is shown by the figures for that year and for 1954.

For 1955, in the age group 15 to 25, there were 212 cases of syphilis, 797 of gonorrhea, and 9 of chancroid, a total of 1,018 cases of venereal disease of all types. This was 40 percent of the total of 2,609 for the State. For 1954, the total was 2,533 cases, of which 1,108, or 44 percent, were in the group aged 15 to 25 years.

When the film, "The Invader," was shown to the staff of the New Mexico Department of Public Health, it was agreed that here was an excellent film for use in our venereal disease educational program. It was particularly suited to the age groups we wished to reach. The film was previewed at different showings by the New Mexico Parent-Teacher Association officials, the Catholic Archdiocese, and the Ministerial Alliance. All were impressed, and gave their approval and endorsement for "The Invader" to be shown to any and all groups, including public, parochial, and private schools.

A letter was sent to all local school and parent-teacher association officials telling them of the venereal disease conditions in the

Dr. Rosenblum and Mr. Corcoran of the Public Health Service Venereal Disease Program are with the New Mexico Department of Public Health, Santa Fe, N. Mex. Dr. Rosenblum is venereal disease control officer and director of the division of preventive medicine. Mr. Corcoran, a health program representative, is also assigned to that division.

This paper was presented at the First International Symposium on Venereal Diseases and the Treponematoses, Washington, D. C., May 28-June 1, 1956.

State and of the proposal to use the film, "The Invader," as an integral part of the health department's approach to the problem. The letter included a short paragraph about the contents of the film and stated that it had been previewed and unanimously approved by the State Parent-Teacher Association, the Catholic Archdiocese, and the Ministerial Alliance. It was suggested that the local parent-teacher association preview the film one evening and present it to the students the following day. A mimeographed list of the 20 questions most commonly asked about venereal disease was enclosed, for presentation to the students prior to their viewing the film. The questions were in a "true or false" form, and the student was not required to sign his name but to give only his age, sex, and grade in school. The letter requested dates and alternate dates of the parent-teacher association meetings.

Response was immediate and overwhelming. The health department was swamped with requests for the film. With only one print on loan from the Venereal Disease Program of the Public Health Service, we were in need of additional prints if we were to carry out the educational program, including the showings of "The Invader," within a 12-month period. One print was purchased, and we prevailed on the Regional Office of the Public Health Service in Dallas, Tex., to lend us another print. With three prints to be divided among a field staff of five, stationed from 200 to 300 miles apart, and the home staff of two, the three films had to be scheduled to arrive at the right time and the right place for a 2-day stay and then be sent to the next showing. Coordinating the logistics on these procedures required the combined efforts of the home and field staffs. Because mail service is often delayed in New Mexico, the prints were sent by public interstate buses. This means of transportation is widely used in New Mexico and offers more frequent and better service to remote areas than do the railroads in transporting mail and freight.

At parent-teacher association meetings, "The Invader" was presented by a member of the health department staff, usually one of the trained venereal disease investigator-interviewers or, rarely, by a public health nurse. The usual procedure was to give a 5-minute

"The Invader"

"The Invader" is a film history of syphilis from the Renaissance to the present day. The pictures and text tell of the 400-year search of scientists for a cure for syphilis, of the discovery of penicillin by Fleming in 1928, and of Mahoney's work with penicillin which resulted in the announcement in 1943 that a cure for syphilis had been found. The film also gives an account of the fight for open discussion of syphilis so that syphilitics can be reached and the "chain of infection" broken.

The informative Film Guide for Teachers and Discussion Leaders issued by the division of instruction of the Georgia Department of Education states that the film "leaves the viewer with the feeling that everyone has a part in helping to conquer syphilis" and that "the surest control of syphilis comes from the integrity within that makes a man or woman live by decent values."

introduction, usually confined to the venereal disease situation in the State, with a few words about the length of the film. The audience was told that a question period would follow the showing of the film.

The following day, when the program was presented to students, usually boys and girls together, the introduction contained the statement that syphilis is a communicable disease and that the program was being presented on that basis and not on the basis of sex education. The students were told that a question and answer period would follow the film and also that the correct answers to the 20 questions distributed earlier would be given. These question lists, which were preferably completed a day or two prior to the showing of the film, were collected by the person showing the film and later were forwarded to the State health department for tabulation. A program has yet to be completed during which the students did not ask questions, such as, "Is there any vaccine for immunity to syphilis?" and, "Can syphilis be inherited?" Almost everyone expressed the opinion that they had learned many things they had not known before, and that they had enjoyed the film.

Some "do's" and "don'ts" may be of value in presenting this film. In making final schedules, make sure that the time does not conflict with a local basketball game, baseball game, or other event, or the program will be presented to an empty hall. When the film is to be shown to several schools in the same community, a local movie theater may be used, thereby saving precious time and personnel. It is wise to carry a projector and a screen and an extra 50 feet of extension cord. Frequently, the projector provided by the school or organization has something wrong with it, and unless a workable projector is on hand, the program will be a failure. Care should be taken to rewind the film after each showing. It is embarrassing to begin a new showing of the film and have to stop and rewind it, thus losing the attention of the audience. When making arrangements to ship the film to another location, the task of transportation should be delegated to a responsible person or the film may be mislaid and delayed, disrupting the schedule.

Through these methods and efforts "The Invader" was shown to 68,229 persons during September 1955-June 1956. The film was seen by the students and faculty of public, parochial, and private junior and senior high schools; civic groups, such as PTA's and miscellaneous clubs; and military personnel, as follows:

| | High schools | Civic groups | Military personnel |
|------------------------|--------------|--------------|--------------------|
| Attendance..... | 33,791 | 19,500 | 14,938 |
| Number of groups..... | 129 | 207 | 5 |
| Number of showings.... | 273 | 207 | 54 |

The following suggestions may help in planning future programs:

1. The film should be prepared with commentaries in several languages. A Spanish commentary would be useful in New Mexico.

2. If the film could be shortened it could be used advantageously for television showing. It is very difficult and expensive to get television time, and "The Invader" runs 37 minutes, making it awkward to fit the pattern of 30-minute TV programs. A 20-minute showing, with an 8-minute discussion, would make a 30-minute program with 2 minutes for the announcer.

Because of its success in New Mexico, we recommend showing "The Invader" as an integral part of a venereal disease education program.

Contributions of Premarital and Prenatal Blood Testing in Syphilis Control

By HAROLD J. MAGNUSON, M.D., JAMES F. DONOHUE, M.P.H., JOHANNES STUART, Ph.D.,
and GERALDINE A. GLEESON, A.B.

MUCH OF THE PROGRESS in syphilis control during recent years has been accomplished through the cooperative efforts of the national venereal disease control program, State and local health departments, and various private agencies. The control measures and techniques used by these health agencies form such a closely integrated system that it is difficult to break down the contributions of certain components or to evaluate the efficiency of specific control measures. However, in this report two segments of the program, namely, premarital and prenatal blood-testing legislation, have been isolated, and an attempt has been made to measure the specific accomplishments of required blood testing.

Aside from the case-finding aspects of required blood-testing programs, the primary purpose of premarital and prenatal blood testing is to preserve the health and welfare of the family unit by preventing the transmission of

syphilis to marital partners and by protecting unborn children from infection with congenital syphilis. Such blood testing also has its educative values.

One of the most immediate results of effective premarital and prenatal blood-testing legislation should be reduction of infant mortality due to syphilis. But since there has been a general downward trend in infant mortality from syphilis during the past 20 years, it is difficult to determine by observation alone whether this reduction in rates would have occurred regardless of blood-testing legislation, or whether there is a definite relationship between the two factors.

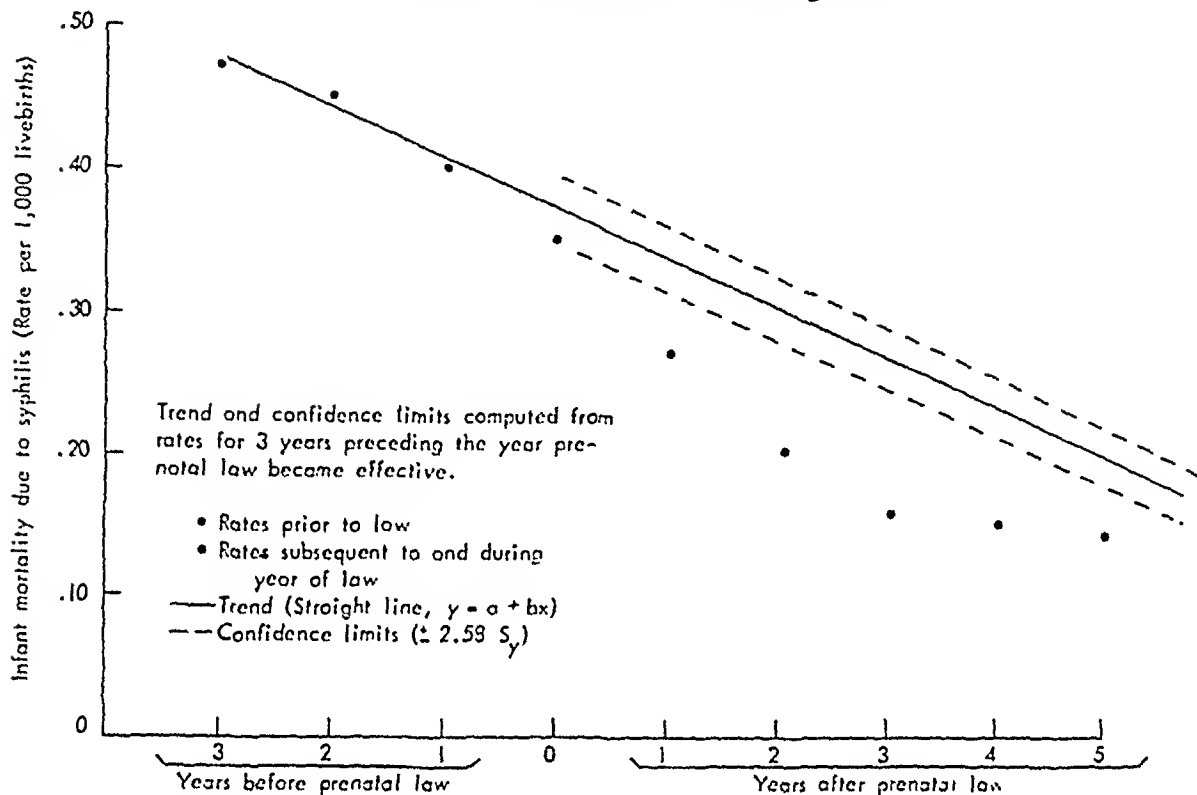
In an attempt to distinguish between the reduction in infant mortality due to blood-testing legislation and the general downward trend in infant mortality, composite rates per 1,000 live births for infant deaths due to syphilis were computed for States having prenatal blood-testing laws during 3 years prior to the year the law became effective. Assuming these three yearly rates to be representative of the general trend of infant mortality due to syphilis immediately preceding the passage of the law, a straight line trend ($a+bx$) was fitted to these rates and then extended through 5 years following prenatal legislation. Confidence limits at the 1 percent level of significance were set up about this extended line to allow for chance variation. The actual observed rates were plotted for the 5 years.

Figure 1 shows that the observed infant mortality rates for all years are significantly lower

Mr. Donohue and Dr. Stuart are chief statistician and program management officer, respectively, Venereal Disease Program, Public Health Service. Dr. Magnuson, chief of the Occupational Health Program, and Mrs. Gleeson, a statistician with the Air Pollution Medical Program, were formerly with the Venereal Disease Program, Dr. Magnuson as chief of the Operational Research Section and Mrs. Gleeson as a statistician.

This paper was presented at the Third Biennial Planning Conference of the Association of State and Territorial Health Directors, Washington, D. C., May 25, 1956.

Figure 1. Composite rate of infant mortality due to syphilis in 42 States before and after enactment of prenatal blood-testing law.



than the expected trend based on rates prior to blood-testing legislation. As a specific contribution to syphilis control, it is estimated that through the effectiveness of prenatal blood testing 1,000 infant deaths from syphilis were prevented in 42 States during the first 5 years following enactment of the law. Since 30 of the 42 States with prenatal blood-testing laws had enacted these laws during 1943, or earlier, the interval represented in the 5-year period is largely coincident with the war years and the immediate postwar years. This reduction in infant mortality due to syphilis becomes even more remarkable in view of the fact that it was accomplished during a period when infectious syphilis case rates among civilians were at a peak and before penicillin became available for civilian use. This points up the vital importance of the operation of required blood-testing programs before, during, and after national crises which boost the rate of venereal disease infection.

The procedure used in evaluating the effectiveness of prenatal blood testing was also

used in examining the efficiency of premarital blood testing. Figure 2 shows that, except for a longer time interval, rates are essentially the same as would be expected before the reduction in infant mortality rates became readily apparent.

Prenatal Testing

To investigate the effectiveness of prenatal blood testing in individual States, the trend established by pre-law rates was related to post-law rates in each of the 42 States having prenatal blood-testing legislation. The results were as follows:

1. Fourteen States had an upward trend in infant mortality from syphilis during the 3 years preceding the effective date of the prenatal blood-testing law. After the passage of the law, all of these States had a downward trend in infant mortality from syphilis and experienced significantly lower rates than expected during 5 years following prenatal blood-testing legislation.

2. Two States with a steady level of infant

mortality due to syphilis during the 3 years preceding passage of the prenatal blood-testing law had significantly lower rates than expected during the subsequent 5 years.

3. Twenty-six States had a downward trend of infant mortality due to syphilis during the 3 years preceding prenatal blood-testing legislation. In all of these States the trend in infant mortality due to syphilis continued downward in the years immediately following legislation, in 7 at a faster pace than expected; in 6 at approximately the pace expected; and in 13 at a slower pace than expected.

As an example of the enactment of a prenatal blood-testing law resulting in decreased infant mortality due to syphilis, the observed rates in relation to expected trend are shown in figure 3 for the State of New Mexico. The significant decrease noted during the years 1950-53, following the passage of the law in 1949, is even more remarkable in view of the fact that New Mexico has for some years had the highest rate of infant mortality from all causes in the United States.

It might be asked if the accelerated decrease in infant mortality due to syphilis was confined to States with required prenatal blood-testing legislation or if States without such legislation experienced a comparable reduction in infant mortality rates. Since there is no date of law enactment to use as a point of reference in establishing an expected trend of infant mortality from syphilis in States without prenatal or premarital blood-testing laws, the selection of a year from which to project such a trend becomes fairly subjective. However, the observed trend line for areas without such legislation shows a gradual reduction in infant mortality from syphilis from 1936 to 1950, but how much more of a reduction would have occurred during these years if blood-testing legislation had been in operation is a matter of conjecture.

In addition to the reduction in infant mortality due to syphilis there is evidence to indicate that prenatal blood testing makes a definite contribution to the control of infant mortality from all causes. Presumably this is accomplished by bringing many expectant mothers to prenatal

Figure 2. Composite rate of infant mortality due to syphilis in 40 States before and after enactment of premarital blood-testing law.

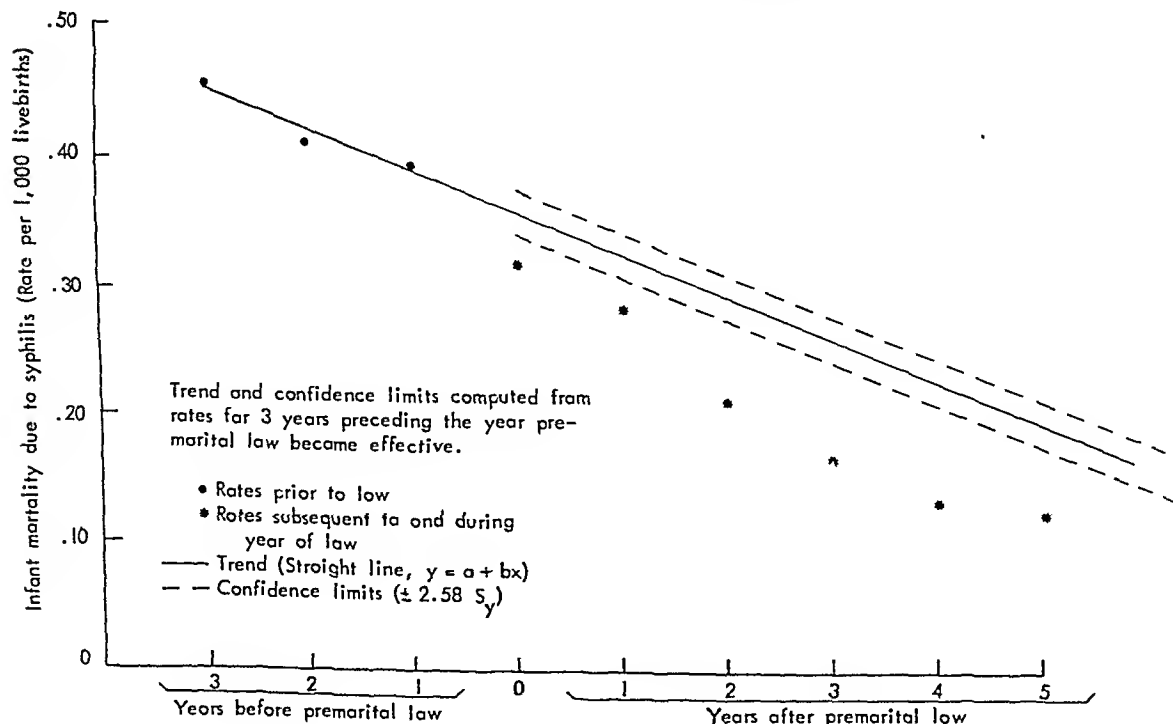
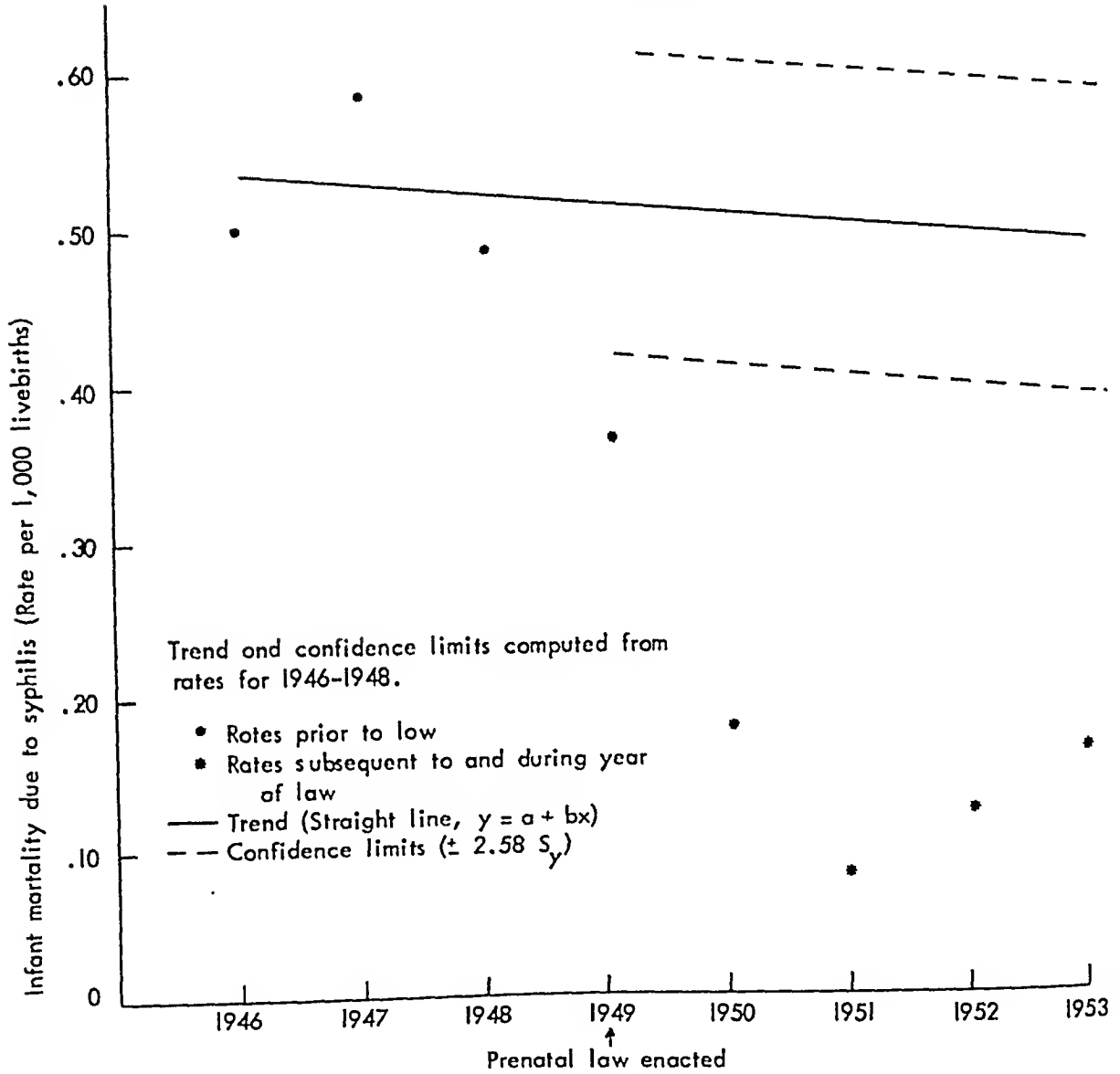


Figure 3. Rate of infant mortality due to syphilis in New Mexico before and after enactment of prenatal blood-testing law.



care which they probably would not obtain otherwise.

For the years 1951-53 the total infant mortality rates were significantly lower in the group of States with prenatal blood-testing laws. Since the States without these laws are not those with unreasonably high infant mortality from causes other than syphilis, it seems reasonable to assume that the lower infant mortality in States with prenatal blood-testing laws may have been due at least in part to increased

prenatal care incident to the required blood-testing program.

Race Distribution

Race distribution is, of course, a very real factor in measuring infant mortality. To determine the results of prenatal blood testing, specific for race, we have prepared some comparative material on areas with and without the law with varying percentages of white population. The 7 areas without prenatal

laws (6 States and the District of Columbia) happen to cluster in 3 geographic areas where white births comprise the following percentages of total births: 63 percent in Alabama, Tennessee, and Mississippi; 75 percent in the District of Columbia and Maryland; and 98 percent in Minnesota and Wisconsin. Total infant mortality in neighboring States with a prenatal blood-testing law and of a comparable proportion of white births was compared with the total infant mortality in these three areas. In every case, regardless of race distribution, the infant mortality rate among the white population was lower in 1953 in States with the prenatal blood-testing law than in States without such a law. Conversely, in all instances, the nonwhite infant mortality rate was higher in States with the prenatal blood-testing law than in States without this law, with the differential becoming greater as the number of nonwhites in the population decreased.

There may, of course, be a number of factors contributing to this paradox among nonwhites. One factor is the administration of the law. This was borne out by a study of New York City birth certificates which asked whether a prenatal blood test had been made (see table).

Results of a study on prenatal care in New York City, 1951

| Race | Number of births | Late or no prenatal STS | |
|-------------------|------------------|-------------------------|---------|
| | | Number | Percent |
| White..... | 4, 905 | 639 | 13. 0 |
| Puerto Rican..... | 521 | 228 | 43. 8 |
| Nonwhite..... | 1, 138 | 441 | 38. 8 |

From birth certificate data it was found that in 13 percent of the white births studied, the mother either had no serologic test for syphilis (STS) or had had an STS only during the last trimester of pregnancy, as compared with 44 percent among Puerto Rican and 39 percent among nonwhite pregnant women. If only 60 percent of nonwhite pregnant women are being adequately tested for syphilis in New York City, where a prenatal law has been in effect since 1938 and where medical facilities are known to be available, there is reason to believe

that administration of the prenatal law is even less effective in areas where prenatal care is less adequate. With higher percentages of nonwhites in an area, the administration of the law becomes less effective for this group.

Penicillin Therapy

Another factor which adds to the difficulty of evaluating prenatal blood testing is penicillin therapy. This has undoubtedly affected, even to the point of destroying trend comparability, the two measures we use to estimate the incidence of congenital syphilis, namely, reported number of cases and infant mortality due to syphilis. With penicillin readily available and carrying little therapeutic risk, many physicians have adopted the policy, in cases of doubtful diagnosis, of treating infants on a prophylactic basis. Since these cases are not diagnosed, they are not included in the congenital syphilis case rate. On the other hand, treatment of syphilitic babies with penicillin has been so successful that infant mortality due to syphilis is no longer comparable to this rate during the arsenical-bismuth era. Thus, the reductions in the incidence of congenital syphilis may be due, for the most part, to therapy rather than to the actual prevention of cases. Very recently, with the alarm aroused by increased reactions to penicillin, this therapy is in many cases being withheld, which complicates the trend pictures even more, but at the same time points up the need for prenatal screening.

Congenital Syphilis

Another facet of the evaluation of required blood-testing programs centers on the difficulty of diagnosing congenital syphilis. In infants, there may be no physical signs of the disease, and the serologic test is sometimes negative until 3 or 4 months of age. In present-day venereal disease control programs, many years pass before it is certain that all children at risk have been screened for congenital syphilis. Mass blood-testing programs are designed for those who have reached early adulthood, and we know from experience that very few cases of congenital syphilis are found in blood-testing surveys. Hence, the child with congenital syphilis often remains undiscovered and un-

treated until he enters school, applies for a job, enters military service, or plans to marry. An effective prenatal blood-testing law will protect him from infection before birth. For instance, in the fiscal year 1955, 4.5 percent of the reported cases of congenital syphilis were in infants less than 1 year old at time of discovery of syphilis, 2.2 percent in children aged 1-4 years, 8.1 percent in children aged 5-9, and 85 percent were in children 10 years old or older. In numbers, this means that 4,700 of the 5,515 patients with congenital syphilis reported in fiscal year 1955 were approaching or had reached adulthood before detection of the disease. This number, added to the undiscovered reservoir of cases still in the population, represents, in a measure, the past failures of prenatal blood testing and points up the need for more effective administration of the law.

Premarital Testing

Reactivity rates in premarital blood testing have not declined in the period 1951-54, the only period for which we have data available. This maintained level of reactivity indicates that whatever reasons there may have been for the original enactment of the laws, these reasons may still be valid. The argument may be raised that premarital blood testing has not discovered an appreciable number of cases of early syphilis; however, it must be kept in mind that premarital blood testing was not expected to find much lesion syphilis. Conservative estimates indicate that 12,000 to 13,000 previously untreated syphilitic persons are found annually through premarital blood testing. Because of the age-interval of candidates for premarital blood testing, most of the cases of syphilis detected are early latent. Our current epidemiological indexes indicate that each person diagnosed with early latent syphilis names, on the average, 2 contacts, and that 115 cases of syphilis per 1,000 of these contacts examined are found as a result of contact interviewing.

Required blood testing has general health educational value. The very fact that it is required by law is convincing proof to many of the efficacy of such a procedure. Very few people submit to premarital or prenatal blood

testing without some notion of why they are being tested. Premarital blood testing, which in most States is incorporated as part of a physical examination, offers the physician opportunities to find lesion syphilis, to do effective case finding of other diseases, and, in some cases, to provide sex education and marriage counseling. Premarital and prenatal blood testing in the control of syphilis are analogous to preventive medicine in other diseases. Since preventive medicine is the very essence of public health, blood-testing legislation is desirable.

As an index of prevalence of syphilis, the need for required blood testing continues. Perhaps of greater importance than as a statistical measure of control, required blood testing screens a segment of the population in which the incidence of early syphilis must be kept at a minimum if venereal disease control is to be maintained. Furthermore, the value of prenatal and premarital blood-testing laws must be measured against the number of cases of syphilis prevented by the existence of these laws as well as in terms of the cases found by their operation.

As a possible example of this dual evaluation of blood-testing laws, 100 cases of early syphilis detected among 100,000 persons examined premaritally would result in an infection rate of only 1 case per 1,000 examined. However, in terms of prevention, the 100 additional new infections which could have developed in prospective marital partners, plus the likely congenital infections in offspring of these marital unions, increase this rate to new proportions. By adding to these infections the previous contacts from which the initial 100 infections were acquired, 1 case actually detected among each 1,000 premarital examinees should be increased to perhaps 5 cases (assuming 2 offspring to each union) to measure more accurately the efficiency of premarital epidemiology and case finding.

Summary

Premarital and prenatal blood-testing legislation, when properly administered, contributes to venereal disease control by (a) detecting and bringing or returning to treatment persons with syphilis, (b) preventing the transmission of syphilis to marital partners, (c) protecting un-

born children from congenital infection, (d) reducing morbidity and mortality due to syphilis and to other causes among infants by encouraging prenatal care, and (e) providing opportunities for general health education, sex education, and marriage counseling. Despite the accomplishments of required blood-testing

programs during recent years, there remains much to be done toward the prevention and control of congenital syphilis. As long as cases of congenital syphilitic infection continue to be found in our population, there is a definite need for strict enforcement of blood-testing legislation.

Revised Statement of Rheumatic Fever Prevention

Revised recommendations for preventing first and repeat attacks of rheumatic fever are incorporated in a new edition of the American Heart Association's statement on Prevention of Rheumatic Fever and Bacterial Endocarditis Through Control of Streptococcal Infections.

This is the second revision of the statement, prepared by the AHA Committee on Prevention of Rheumatic Fever and Bacterial Endocarditis to keep pace with the progressively growing body of knowledge and experience in this field. The committee points out that no recommendations can be considered final at this time. Revisions and changes will be made as new knowledge may indicate.

Principal Changes

Following are the principal changes in the recommendations:

1. Greater emphasis is placed on the value of throat cultures in diagnosing streptococcal infections with a view to stimulating an increased use of cultures, particularly when clinical manifestations alone are inconclusive.

2. The recommended duration of prophylaxis has been qualified. The committee reaffirms its view that continuous prophylaxis should be maintained indefinitely for known rheumatic subjects, but it recognizes that some physicians may wish to make exceptions in certain of their adult patients, particularly those without heart disease who have had no rheumatic attacks for many years.

3. Monthly injection of 1,200,000 units of benzathine penicillin G intramuscularly is now listed first among prophylactic methods. The committee also indicates that it is preferable, if oral penicillin is chosen as the method of prophylaxis, to prescribe 200,000-250,000 units twice daily, rather than once.

providing an additional safeguard against breakthroughs which have been reported with the smaller dosage.

Bacterial Endocarditis Prophylaxis

Also revised in the statement are the recommended dosages for prophylaxis against bacterial endocarditis in patients with rheumatic or congenital heart disease who are obliged to undergo such surgical procedures as dental extractions and tonsillectomies. Emphasizing that the dosage regimens used for long-term prophylaxis of streptococcal infections are inadequate for this purpose, the committee recommends that high blood levels of penicillin be maintained for several days (rather than, as previously stated, on the day of operation alone) to prevent organisms from lodging in the heart valves during the period of transient bacteremia.

In general, the combined oral and parenteral route of administration is preferred, as follows: oral penicillin (200,000-250,000 units four times a day) for the 2 days before and the 2 days after surgery; the same dosage of oral penicillin on the day of surgery plus 600,000 units of aqueous penicillin with 600,000 units of procaine penicillin shortly before operation. Alternative recommendations are included for situations in which injection is not feasible or penicillin is contraindicated.

The revised statement appears in the December 1956 issue of *Modern Concepts of Cardiovascular Disease* and in the January 1957 issue of *Circulation*. An outline of a recommended method for culturing beta hemolytic streptococci from the throat is also being made available by the association and may be obtained from local heart associations or the American Heart Association, 44 East 23d Street, New York 10, N. Y.

Serology Control Program Of the Venereal Disease Research Laboratory

By AN HARRIS
and HILMED N. BOSSAK, B.S.

THE SEROLOGY CONTROL program of the Venereal Disease Research Laboratory was evolved to assist State laboratories in attaining and maintaining a high level of efficiency in serologic testing. Through these State laboratories, the testing efficiency of all laboratories of this country performing serologic tests for syphilis may be favorably affected. This program has nine integrated segments, each of which is of little value as a separate entity, but which, collectively, have been effective in reaching the objective with a minimal expenditure of time and money. The serology control program has also served as a pattern of operation used by several States as a service to the laboratories within their jurisdictions. Available to the central laboratories of the 48 States, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands, the services of the program include:

Providing a laboratory manual prepared by the staff of the Venereal Disease Research Laboratory.

Providing reference-standard serologic reagents prepared by the staff of the Venereal Disease Research Laboratory.

Inspecting laboratory serology control programs.

Conducting scheduled training courses.

Conducting field refresher training courses or workshops.

Standardizing and supplying dehydrated control serum.

Conducting hemispherewide serologic evaluation studies on a continuing basis.

Mr. Harris is director of and Mr. Bossak is a bacteriologist with the Venereal Disease Research Laboratory, Public Health Service, Chamblee, Ga. Their paper was presented at the First International Symposium on Venereal Diseases and the Treponematoses, Washington, D.C., May 28-June 1, 1956.

Participating as a control or co-control in intrastate serologic evaluation studies.

Offering a *Treponema pallidum* immobilization (TPI) testing service, nationwide, through the State and Territorial laboratories.

Manual of Serologic Tests

A Manual of Serologic Tests for Syphilis has been prepared with the assistance of the authors of the tests and is revised at appropriate intervals. The manual contains general information about equipment; cleaning and care of glassware, antigens, and other reagents used in serologic tests; the effect of room temperature on test results; reporting of serologic test results; and laboratory control of test performances. Technique outlines, including recommendations for equipment, glassware, reagents, and step-by-step procedure for APIA reference, Hinton, Kahn, Kline, Kolmer, Mazzini, Rein-Bossak, and VDRL tests, are contained in the 1955 edition (1). Instructions are given in the appendix for the collection and preservation of sheep red cells, preparation and preservation of complement, use of merthiolate as a bacteriostat for spinal fluid, and a recommended method for quantitative determination of spinal fluid protein. This manual has been revised at approximately 5-year intervals in order to stay abreast of acceptable changes in the field of serology. The 1955 edition is the latest revision.

Services to Laboratories

Standardized antigens and other reagents for the tests listed in the Manual of Serologic Tests for Syphilis are prepared and made available for check-testing purposes to commercial or State laboratories that manufacture or purchase these reagents. During past years, the older type, lipoidal antigens were standardized and distributed for use in check-testing but this activity is now confined to the cardiolipin-type antigens. Verification testing of antigens prepared by State laboratories is also done on request. Agreements have been reached under which samples of VDRL antigen are submitted to the Venereal Disease Research Laboratory for check-testing and approval before sale by commercial laboratories in this country.

State laboratories are visited on request for consultation and for reviewing their serology program (testing, laboratory control, training, and laboratory visitation). Written reports of observations, commendations, and recommended changes, if any, are submitted to the State laboratory director and the State health officer. This service will be more fully described in a later paper.

Training Courses

Training courses are regularly scheduled at the Venereal Disease Research Laboratory. Nine 2-week courses were scheduled during the fiscal year 1956; 10 courses were held. Applications from this country for these 2-week courses must be signed by the State health officer or the State laboratory director, unless the applicant is an employee of the Public Health Service, in which case the application must be approved by the medical officer in charge of the laboratory where the applicant is employed. Trainees are accepted from Armed Forces installations in this country and from the World Health Organization, the Pan-American Sanitary Bureau, and employees of central laboratories in other countries. Schedules of courses for each fiscal year are distributed before July 1, and reservations are made as soon as applications are received. Application lists are closed 1 month before the dates the courses are to start.

Five courses titled "Serology of Syphilis" were scheduled for the fiscal year beginning July 1956. These courses provide refresher training to senior operating personnel of State and Public Health Service laboratories. They are composed of lecture, demonstration, and participation periods covering the most widely used American methods for the serodiagnosis of syphilis, with references to latest developments in this field.

The two courses in management and control of syphilis serology by the regional laboratory are designed for assistant laboratory directors and senior laboratory staff members and include review of interlaboratory serologic evaluation studies, laboratory inspection procedures, demonstration of antigen check-testing and standardization, and preparation of control serum.

Courses about tests for syphilis using the *Treponema pallidum* include lectures, demonstration of and class participation in the immobilization (TPI), agglutination (TPA), complement-fixation (TPCF), immune-adherence (TPIA), and other tests which use the virulent *Treponema pallidum* as an antigen source. The complexity of these tests requires that these classes be limited to small groups, so it has been necessary to schedule additional classes when large numbers of qualified applicants have applied. Applicants for these courses should have had adequate experience in the field of serology and be in supervisory positions.

Field refresher training courses are also held in cooperation with State department of health laboratories. On-the-job training is also accomplished during visits to Public Health Service laboratory facilities.

Control Serum

Dehydrated control serum for serologic tests for syphilis is offered to the State laboratories and to Public Health Service laboratories on a continuing basis. Twenty-six ampules of serum, considered to be a 6 months' supply when used at the rate of one ampule per week, are sent with a protocol showing the reactivity of each lot of serum in all of the tests performed at the Venereal Disease Research Laboratory. Continuous use of this control serum will allow the laboratories to determine the relative reactivity of their tests as compared with the same tests performed at the Venereal Disease Research Laboratory and, secondly, will show whether the reactivity of their tests is remaining at a constant level or is varying from day to day. The laboratories that use this serum do not report their findings to the Venereal Disease Research Laboratory, since this is not considered to be an evaluation service.

Serologic Evaluation Studies

The Public Health Service Serologic Evaluation Study is presently being conducted by distributing 20 samples of prepared sterile serum to each of 62 participating laboratories in each of 10 months of the fiscal year. During

the remaining 2 months, all reports are tabulated and an analysis of comparative results is issued. Laboratories participating in this study during the fiscal year 1956 included the central laboratories of the 48 States, the District of Columbia, Alaska, Puerto Rico, Hawaii, Mexico, and Canada, plus the Kahn, Kline, Kolmer, Hinton, Rein, and Mazzini laboratories and the Venereal Disease Research Laboratory. This type of serologic evaluation study produces data that may be used to ascertain relative efficiency of many laboratory performances of each type or kind of test as compared with the test-author results. In order to make available to the participating laboratories some comparative results before the yearly report is analyzed, a report of the results obtained at the Venereal Disease Research Laboratory each month, with all procedures, is sent to all participating laboratories as soon as their monthly report is received.

A similar, but smaller, serologic evaluation study is presently being conducted for the laboratories of Public Health Service facilities. In this study, 10 samples of prepared serum will be sent monthly for 5 months of this fiscal year to each of 26 Public Health Service laboratories. A report of the results obtained with the VDRL slide test and the Kolmer test at the Venereal Disease Research Laboratory is returned to the laboratories participating in this study as soon as their monthly reports are received.

Use of VDRL Services

The central laboratories of all 48 States, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands have received one or more of the services referred to in this report during the recent past. In the calendar year

1955, these laboratories utilized the services and control functions of the Venereal Disease Research Laboratory 261 times, in addition to submitting 2,575 serums for TPI testing. Additional services were given to the central laboratories of other countries either directly or through the function of the Venereal Disease Research Laboratory as a reference laboratory for the World Health Organization.

TPI Testing Service

The *Treponema pallidum* immobilization (TPI) test has been offered since January 1955 as an additional reference service, on a nationwide basis, through the laboratories of State health departments, by the Venereal Disease Research Laboratory. Criteria for acceptance of specimens for this testing are stipulated. Blood specimens are sent to State laboratories, where sterile serum is separated and forwarded to the Venereal Disease Research Laboratory. Each specimen of serum must be accompanied by a completed clinical data sheet containing statements about evidence or history of treponematosi; syphilis in the family; other venereal diseases; record of known STS; diseases other than treponematosi especially those presumed to elicit nonspecific reactions in STS; and the opinion of the attending physician regarding present diagnosis. Reports of TPI tests are sent to the respective State laboratories for forwarding to the submitting physician. During the first months of 1956, requests for this service were received at the rate of approximately 100 per week.

REFERENCES

- (1) U. S. Public Health Service: Serologic tests for syphilis. 1955 manual. PHS Pub. No. 411. Washington, D. C., U. S. Government Printing Office, 1955.

Occupational Health on Farms

By HENRY N. DOYLE

HEALTH AGENCIES have many as yet undischarged responsibilities toward rural Americans. To comprehend the responsibilities of official agencies for occupational health on farms, it is useful to grasp the extent of industrialization of American agriculture.

The population of the United States in 1910 was 92 million. Today, it is 166 million, an increase of 80 percent. In 1910 there were 322 million acres of cropland. Today there are 350 million acres of cropland, an increase of only 9 percent. Yet, this acreage produces more than enough food for our expanded population. It is estimated that 310 million acres will supply our 1960 population, thanks to the increase in productivity per acre. Improved soil management, such as erosion control and the use of fertilizers and other agricultural chemicals, including pesticides and weedkillers, have contributed part of this gain. Power machinery has increased the farmer's capacity to plow, sow, harvest, and manage livestock. Furthermore, market crops now grow on about 75 million acres formerly used to grow feed for the horses and mules which have been replaced by power machines.

Mechanization has made it possible for farms to produce more than enough for our present needs through the efforts of only 6,500,000 farm workers, or 11 percent of our working popu-

lation, whereas in 1910, 11,600,000, or 31 percent, were employed in agriculture.

The number of American farms in 1954 was 5,425,000, as compared with about 6,600,000 in 1910. More important, half of our present farms produce nine-tenths of the crops. This concentration offers a striking parallel to many industries in which a small number of large companies account for a high percentage of the total production.

Even as large manufacturing concerns tend, with large-scale operations, to employ the latest advances in mechanization, so, and frequently to a greater degree, large farms tend to employ mechanical equipment. The capital investment associated with many of the new mechanical farm devices often runs to a sum which is not economical for a single-family farm.

Some idea of how mechanization has progressed in farming may be obtained from United States Department of Agriculture statistics which reveal that between 1941 and 1952 the number of tractors increased from 1.7 million to 4.4 million (159 percent), the number of grain combines from 225,000 to 940,000 (318 percent), and the number of mechanical corn-pickers from 120,000 to 635,000 (429 percent). The increase of total power on American farms during that period exceeded 70 percent. Farm output per man now has approximately doubled in the 15 years since Pearl Harbor.

Agricultural changes during the past generation, therefore, have come to create new working conditions even as industrialization changed working conditions in mines and mills.

How do these new conditions affect the health and safety of farm workers? Farming is intrinsically hazardous. Injuries have always been frequent on farms. Although statistical

Mr. Doyle is assistant chief of the Occupational Health Program, Public Health Service. His paper and the summaries of the papers on silicosis and X-ray exposure (p. 149) are based on talks delivered to the American Conference of Governmental Industrial Hygienists, Philadelphia, April 21-24, 1956.

evidence is lacking, experience has led us to expect many injuries from the handling of farm horses. A limited survey in one county within the past 6 months showed that 8 out of 29 recent accidents were associated with horses. Even with mechanization, farmers tend to keep a few horses. Of 44 farms visited in this survey, 36 had at least one horse. The total was 182.

Other farm animals also, particularly bulls, present hazards to farm hands. Injuries from the use of sharp or heavy tools or the stress of heavy lifting also are common farm afflictions, frequently resulting in chronic conditions, herniation, paraplegia, or impairment of vision.

The danger of infections from injuries incurred on the farm must be considered much greater than that in industry. This danger is heightened by the nature of the working environment, the inaccessibility of first-aid facilities, and the absence of interest in giving prompt care to minor wounds and other dermatological conditions. The prevalence of the tetanus hazard on farms is well recognized by physicians, but other organisms also must be considered.

A number of bacterial diseases are associated with agricultural work. Brucellosis, or undulant fever, is thought to be the most common one, but reliable statistics are lacking. It is not likely that all brucellosis is correctly diagnosed or that all diagnosed cases are reported. One factor contributing to the incidence of brucellosis is that rather than call upon a veterinarian, many farmers themselves vaccinate cattle and thereby risk accidental infection. Other diseases of significance on farms include anthrax, erysipeloid, leptospirosis, tularemia, bovine tuberculosis, and various forms of salmonellosis.

By occupation, the farmer is exposed also to viral and rickettsial diseases, including equine encephalomyelitis, psittacosis, Q fever, and Rocky Mountain spotted fever. There is a long list of mycotic diseases, of which *actinomycosis* and *histoplasmosis* are examples. A number of parasitic diseases also are potential farm hazards.

Moving from these biological hazards to physical agents, we find that farm work involves exposure to extremes of temperature,

both high and low. Heat exhaustion and heat stroke undoubtedly affect many farm workers. Another condition of possible significance is skin cancer, produced by prolonged exposure to the sun's rays.

The increased use of machines has brought a whole group of hazards new to agriculture. Noise exposures, for example, may now be sufficient to affect the hearing of farmhands who operate machines for extended periods. When more is learned about the problem of vibration, it may also be found to have adverse health effects on agricultural workers. Maintenance and repair work on farm machinery introduce hazards associated with welding.

Accidents incurred in the use of farm machinery represent one of the major categories of farm hazards. Accident rates in agriculture are far above industry as a whole. In 1951 only the mining and construction industries had higher death rates: Agriculture had 60 fatal work accidents per 100,000 (a total of 3,800) as compared with a rate of 25 per 100,000 for all industries. The injury rate, according to the National Safety Council, was 4,930 per 100,000 as compared with 3,240 per 100,000 for all industries.

Hazard From Chemicals

In addition to biological and physical hazards, the industrial hygienist who looks at present-day farming is struck forcibly by the number of toxic chemicals in use. Although many of these are soil conditioners and fertilizers involving little hazard, the majority are insecticides, fungicides, rodenticides, nematocides, and weedkillers which are employed specifically because of their toxic properties. While some are comparatively safe, nearly all present some degree of danger, and some must be classified as extremely hazardous. In particular, the heavy metals, such as lead, arsenic, and mercury, the halogenated hydrocarbons, and the organic phosphates present serious potential dangers to the people using them and sometimes to others working or living in the vicinity.

In dealing with industrial exposure to hazardous materials, we frequently express the view that any material, regardless of toxicity, can be used safely provided that proper

control measures are employed. The same philosophy might be applied to agriculture, but assurance of proper control measures is harder to obtain, at least at the present time. The reasons are apparent. Industrial operations are usually performed in a fixed location where exhaust ventilation or other suitable control methods are feasible. Industry has been subjected to fairly extensive and intensive educational programs on health and safety for at least a generation. Large companies usually have full-time safety and medical departments alert to potential dangers. Furthermore, personnel of insurance carriers and official agencies make frequent visits to industrial plants to check for possible hazards.

On the other hand, agricultural workers generally have little idea of the hazards of handling and applying powerful chemicals. Although most chemicals of this type carry warnings on the container labels, the tendency is to pay little or no attention to the labels, particularly if a material has been used previously without untoward incident.

Moreover, the methods of application are almost as varied as the materials used. Many of these methods present dangers that would not be tolerated in manufacturing establishments. For example, the application of fumigants such as carbon tetrachloride in connection with grain storage may employ techniques that would horrify an industrial hygienist. A recent farm survey observed workers tying handkerchiefs over their faces to protect themselves from heavy concentrations of carbon tetrachloride.

The hazards of farm life are not to be ignored. And they are not ignored although much remains to be done to protect the farmer's health.

Health Services for Farm Workers

Occupational health programs are conducted in official agencies either because of laws specifically concerning industrial working conditions or because of broad powers regarding the protection of health. Virtually all such programs were introduced to cope primarily with problems associated with manufacturing, and, sometimes, also mining. Few

of them gave much thought initially to the farm worker. In recent years, certain State officials have devoted attention to specific farm problems brought to their attention. For example, in Florida, in 1952 there were 46 claims for parathion poisoning filed; in 1953, there were 45. The Florida State division of industrial hygiene has since conducted an educational campaign among citrus grove and truck garden owners on the hazards of insecticides and preventive measures.

Also, California has conducted investigations of the high incidence of occupational disease among its agricultural workers. In 1954, of 23,101 reports of occupational disease in California, 3,143 (13.6 percent) were for agricultural workers.

In addition to purely occupational influences, the health of many farm workers is affected by environmental factors that are much less significant among present-day urban workers. Farm laborers, especially migrant workers, sometimes must live where housing and sanitation levels are far below those now considered as acceptable or safe. Large numbers of workers move from one State to another in pursuit of peak season farm work, and they stop at places where waste disposal is primitive, where water supplies are of questionable quality, where food spoilage is difficult to prevent, and where protection against flies and other disease carriers is absent. With this mobile population, numbering more than the citizens of several States, public health considerations demand far more than control of the traditional occupational diseases. In addition to basic sanitation, there must be answers to knotty questions of medical care for individuals not eligible for service available to permanent residents. Otherwise, it is reasonable to expect that transient workers will be permitted to carry communicable disease to every community that summons their services.

While rural health services can use all available community resources, occupational health personnel must not overlook their special responsibility. Industrial hygienists, in checking the working environment in factories and mines, are also concerned with the water supply, washing facilities, waste disposal, and food sanitation. Nor should they neglect these

points with respect to farm work, or, for that matter, in other situations where rural workers are housed temporarily, as in construction camps. Since such responsibilities also rest upon other personnel in State and local health agencies, policies for the best utilization of available man-hours must be developed to meet the individual situation. It is important, however, to recognize the place of environmental and medical care services in the occupational conditions of agricultural workers.

South Dakota and Iowa Programs

As stated before, a number of State occupational health officials have concerned themselves, to a limited extent, with specific or selected health needs of agricultural workers. To the best of our knowledge, however, no agency has ever considered the total need, with the objective of ascertaining the extent and severity of health problems on the farms of its State. This approach, which has been applied effectively by the States in planning logical and sustained programs for the improvement of worker health in industry, must now be used in agriculture if we are successfully to protect and improve the health of the farm family and its helpers.

The first stirring of activity in this direction came in 1955, when the South Dakota Department of Public Health requested assistance in planning an occupational health program for the State. In response to this request, the Public Health Service suggested that the program be developed to give industry and agriculture equal consideration from the start. To help develop such a program, the Occupational Health Program of the Public Health Service assigned a veterinarian to South Dakota in September 1955. Through this project it is hoped to evaluate the effectiveness of certain

survey techniques and to develop useful information regarding occupational health problems and methods for their attack.

Coincidentally, during 1955 the State University of Iowa Medical School established an Institute of Agricultural Health which will study similar questions in Iowa.

It is significant, we believe, that these related projects were independently conceived and started at this time. Although the existence of health and safety hazards on the farm has been recognized by public health authorities for some years, the South Dakota and Iowa programs represent the first positive steps taken toward a comprehensive approach to the problem.

While some findings from these two States may become available relatively soon, other States need not wait for them before taking stock of the adequacy of their activities with respect to this particular segment of the employed population. Indeed, because of variations in crops, climate, soil, and other factors, problems will be found to differ in each locality, and all States can contribute appreciably to scientific knowledge while carrying out a public health activity of real merit.

The subjects which need exploration are numerous. Study needs to be made of the toxicology and proper application of chemicals, of the safe use of mechanized equipment, of the general health status of agricultural workers as compared with the rest of the population, of the effectiveness of educational measures, and of the availability of health resources.

This is a new and complex field confronting the industrial hygienist. Occupational health needs on the farm may not be readily anticipated, but in every State where agriculture is a significant industry, an earnest beginning should be made to meet this public health responsibility.

Pediatricians Receive Low X-ray Doses



X-rays as an occupational hazard of physicians have been associated with a relatively high incidence of leukemia in the medical profession.

In an effort to measure the probable routine exposure to radiation of certain specialists in private practice (in contrast to the number of such studies that have been pursued in hospitals), representatives of the Public Health Service arranged to survey the offices of 55 pediatricians in Hamilton County, Ohio.

All but 10 of the physicians used X-ray equipment, mainly for fluoroscopy. The survey was confined to this use. Instruments measured the time the fluoroscopes were in operation for 2 weeks; pocket chambers and film badges determined the exposure of the physicians in the period studied; the team inspected the condition and operation of the equipment; and the medical officer examined the physicians for evidence of gross radiation injury.

The condition of the equipment presented shock hazards, apart from the danger of radiations. Nearly half of the machines were not grounded. Several, thought to be grounded, were not. Also, certain high voltage conductors were exposed.

Scatter or stray radiation at points where the fluoroscopist would be exposed exceeded 50 milliroentgens per minute in 14 instances. Patient's exposure to 6 of the machines exceeded 20 roentgens per minute. Another 16 were above 10 roentgens per minute. The recommended limit is 10 roentgens per minute. For infants and children, it should be much less than that.

The physicians with highest exposures were able to identify and correct errors in procedure.

By Peter J. Valac, B.S., electronics scientist, and Mitchell R. Zvon, M.D., formerly surgeon, Occupational Health Field Headquarters, Public Health Service, Cincinnati. Dr. Zvon is now with Kettering Laboratory, Cincinnati. The full paper is to be published in the American Industrial Hygiene Association Quarterly for March 1957.

Three had worn no lead garments. One used a beam of high intensity. Another held the patient, a child, and received high dosage to his arms.

The saving factor in the situation was that more than half of the fluoroscopes were used less than 1½ minutes a week. Consequently, most exposures of physicians were well below present recommended limits.

Silicosis Prevalence Persists in Industry



Silicosis persists in the United States both as an occupational hazard and as a cause of chronic if not disabling illness among many who were exposed before industrial safeguards had been established. This finding is based on a study of official records from scattered sources, described in some detail at the conference and in other publications.

The study, undertaken by the Division of Special Health Services, Bureau of State Services, Public Health Service, aimed to develop answers to four questions:

1. What is the prevalence of silicosis in the United States?
2. What are the characteristics of the silicotic population?
3. Are a significant number of new cases developing among workers entering dusty trades for the first time in the past 20 years?
4. What aspects of dust exposure need further study?

The findings of the study are to be presented in a special bulletin.

Preliminary observations indicate that the prevalence of silicosis may be several times the number of cases, more than 10,000 that were compensated or reported in one form or another in 22 States in 1950 to 1954, inclusive.

By Victoria M. Trasko, program adviser, Occupational Health Field Headquarters, Public Health Service, Cincinnati.

Geographic variations in prevalence were affected not only by industrial patterns but also by legal variations. In States where partial disability is compensable, it was to be expected that a relatively greater number of cases would be reported.

A strong indication that the number reported is below the real prevalence figure is found in the fact that in the 5-year period probably 10,000 died from occupational lung disease, but of the more than 10,000 cases reported for this study only 4 of 5 persons are known to have died.

The silicotic patients studied were in the main elderly. Of 4,814 analyzed in all stages of the disease, only 120 were under 35, 1,025 were age 35 to 49, 2,437 were 50 to 64, and 1,232 over 65. In effect, three-fourths were more than 50 years old. But in certain States, depending on the source of information, a much higher proportion of the men were relatively young. This was true especially in eastern States.

These findings provide a partial answer to the third question. Although many cases are the consequence of exposure in days when protective measures were lacking, there are enough young men who must have been exposed in recent years.

The mobility of the working force, with frequent job changes, hinders efforts of the epidem-

ologist to determine which industries are most productive of silicosis, but the highest proportion of cases appear to have been associated with mining, especially coal mining and secondarily metal mining. Of the forms of manufacture associated with silicosis, foundries appear to have been as productive of silicosis as metal mining. This analysis only suggests the most productive sources of the disease, not the relative dangers in the industries concerned.

To judge by the numbers of young men affected, no industry can be certain that it is protecting completely its employees from exposure to dust. Sufficient evidence was uncovered to suggest that either the application of dust control measures is not universal or other factors are involved. The studies suggest that, with relatively light and brief exposures to dust, the disease may take longer to develop than in the past, a possibility that cannot be determined for some years to come.

Such questions warrant further study, especially in view of the rising trend of applications for compensation or public assistance for silicotics. Future studies will be facilitated if diagnosis and reporting improve, if diagnoses and terminology are consistent, and if standards are applied to criteria of disability and to supervised employment of nondisabled silicotics.

Venereal Disease Course

The 26th Venereal Disease Postgraduate Conference for Physicians, sponsored by the University of Tennessee College of Medicine and the Public Health Service, will be held at the College of Medicine in Memphis, April 18-20, 1957.

The course is designed to acquaint the practitioner with the latest developments in diagnosis, treatment, and management of the venereal diseases. Discussion leaders for the course will be drawn from university faculties, Public Health Service personnel, and other outstanding authorities in the field.

No tuition will be charged. Applications for admission are to be sent to Dr. Henry Packer, Department of Preventive Medicine, University of Tennessee College of Medicine, Memphis 3, Tenn.

Analyzing the Tuberculosis Case Register

By HERMAN E. WIRTH, M.D., M.P.A., and BEN Z. LOCKE, M.S.

THE FIRST statewide analysis of local tuberculosis case registers in New York State, excluding New York City, was undertaken in 1952. This analysis was based on certain data contained in the registers maintained by 38 city, county, and State health district jurisdictions. The objectives were to determine the number of cases requiring supervision; to study the characteristics of known cases with respect to age, sex, residence, stage of disease, clinical status, sputum status, and type of supervision; and to evaluate the effectiveness of control activities.

The methods used and results obtained were distributed to all full-time health officers concerned and were published in detail (1). Subsequently, regional conferences were held for three major areas, Buffalo, Rochester, and Albany, for the purpose of reviewing the reported findings and of exploring methods for solving the questions raised by the analysis. These regional conferences, consisting mainly of informal roundtable discussions, were attended by regional and local health administrators, tuberculosis hospital directors, supervising public health nurses, program directors, and staff statisticians as well as representatives of local voluntary tuberculosis associations.

In 1955 a second statewide analysis was conducted from February through June to obtain similar data and to determine what changes

had occurred. The second analysis was also desirable to ascertain the indirect effects of the widespread use of antimicrobial drugs, the emergence of treatment plans on a nonhospitalized basis, and the emphasis on resectional surgery. In addition, there was the need to know what administrative steps had been taken locally to provide more and better service, streamline procedures, remove "deadwood" from the registers, and encourage possible savings. Thus, a fourth objective in the 1955 analysis was a review of the epidemiological and administrative changes in the interim period. Certain items of the 1952 analysis were discarded and other more significant ones included. At the time of the second analysis, 40 local agencies were maintaining case registers.

Administrative Aspects

The value of the case register to administrators depends on the up-to-dateness of entries relating to the persons registered. For the health officer, the register must present the significant facets of the tuberculosis problem in the community if he is to initiate in proper degree those activities needed to resolve the problem. Such activities as case and contact finding, nursing supervision, laboratory and X-ray examination, clinical consultation, treatment, hospitalization, and disposition can only be effectively conducted with the aid of timely data periodically obtained and promptly recorded in adequate detail. This need has been stressed often (2-5).

Of 23,112 cases contained in registers, 4,807 were excluded from the 1955 study because their retention in the visible case registers was not

Dr. Wirth, who has been with the New York State Department of Health since 1948, is associate director of the division of tuberculosis control. Mr. Locke, now chief of the Consultation Unit, Current Reports Section of the National Institute of Mental Health, Public Health Service, was with the New York State Department of Health from 1947 to 1956.

Geographic variations in prevalence were affected not only by industrial patterns but also by legal variations. In States where partial disability is compensable, it was to be expected that a relatively greater number of cases would be reported.

A strong indication that the number reported is below the real prevalence figure is found in the fact that in the 5-year period probably 10,000 died from occupational lung disease, but of the more than 10,000 cases reported for this study only 4 of 5 persons are known to have died.

The silicotic patients studied were in the main elderly. Of 4,814 analyzed in all stages of the disease, only 120 were under 35, 1,025 were age 35 to 49, 2,437 were 50 to 64, and 1,232 over 65. In effect, three-fourths were more than 50 years old. But in certain States, depending on the source of information, a much higher proportion of the men were relatively young. This was true especially in eastern States.

These findings provide a partial answer to the third question. Although many cases are the consequence of exposure in days when protective measures were lacking, there are enough young men who must have been exposed in recent years.

The mobility of the working force, with frequent job changes, hinders efforts of the epidem-

ologist to determine which industries are most productive of silicosis, but the highest proportion of cases appear to have been associated with mining, especially coal mining and secondarily metal mining. Of the forms of manufacture associated with silicosis, foundries appear to have been as productive of silicosis as metal mining. This analysis only suggests the most productive sources of the disease, not the relative dangers in the industries concerned.

To judge by the numbers of young men affected, no industry can be certain that it is protecting completely its employees from exposure to dust. Sufficient evidence was uncovered to suggest that either the application of dust control measures is not universal or other factors are involved. The studies suggest that, with relatively light and brief exposures to dust, the disease may take longer to develop than in the past, a possibility that cannot be determined for some years to come.

Such questions warrant further study, especially in view of the rising trend of applications for compensation or public assistance for silicotics. Future studies will be facilitated if diagnosis and reporting improve, if diagnoses and terminology are consistent, and if standards are applied to criteria of disability and to supervised employment of nondisabled silicotics.

Venereal Disease Course

The 26th Venereal Disease Postgraduate Conference for Physicians, sponsored by the University of Tennessee College of Medicine and the Public Health Service, will be held at the College of Medicine in Memphis, April 18-20, 1957.

The course is designed to acquaint the practitioner with the latest developments in diagnosis, treatment, and management of the venereal diseases. Discussion leaders for the course will be drawn from university faculties, Public Health Service personnel, and other outstanding authorities in the field.

No tuition will be charged. Applications for admission are to be sent to Dr. Henry Packer, Department of Preventive Medicine, University of Tennessee College of Medicine, Memphis 3, Tenn.

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Table 1. Tuberculosis cases excluded from 1952 and 1955 analyses, New York State exclusive of New York City

| Status | 1952 | 1955 |
|--|-------|-------|
| Total..... | 4,959 | 4,807 |
| Inactive, 18 months or more..... | 3,003 | 2,927 |
| Minimal, arrested 2 years or more..... | 1,141 | 737 |
| Healed primary..... | 291 | 478 |
| Healed nonpulmonary..... | 21 | 137 |
| Suspect..... | 102 | 328 |
| Dead..... | 101 | 200 |

in accordance with the suggested criteria of the New York State Health Department (6-8). Nearly 5,000 such cases had also been excluded from the 1952 analysis (table 1). Thus, there was no significant change despite the fact that removal of the cases would have aided materially in the management of the registers.

Although the health department's criteria for removing cases from the visible registers are not mandatory, their use provides a systematic and standardized approach to related clinical and clerical management problems.

The visible case register, or active file, contains the tuberculosis case and contact register cards on all cases classified as active, arrested, and inactive for less than 18 months among residents of an area administered by a full-time local health officer. The clinical status considered here refers to the 1950 classification of pulmonary tuberculosis of the National Tuberculosis Association.

After excluding these 4,807 cases, 18,305 known tuberculosis patients were recorded as requiring active medical and nursing supervision compared with 19,923 patients in 1952. Thus, the rate per 1,000 population of 2.4 in 1955 as compared with the 2.8 in 1952 represents a decrease of only 14 percent. The rate per 1,000 population in 1955 ranged from a low of 0.8 in Allegany County to a high of 6.2 in Franklin County. In 1952 the rate varied from 0.9 for Schuyler County to 9.9 for Franklin.

In contrast, between 1951 and 1954, the years that best compare with the years in which the data on the case registers were collected, the death rate fell 53 percent and the newly reported case rate fell 26 percent. It is thus apparent that, as the emphasis on new cases is

shifted to all known cases requiring active care, the need for medical facilities, care, and supervision still definitely exists.

Prevalence

The prevalence of known tuberculosis throughout New York State, except New York City, is determined from the visible registers (active files) of the local health offices. Actually, many persons with known disease do not constitute public health hazards and consequently should be withdrawn from the active registers although they may be under the care of a clinic or private physician. Conversely, there are as yet thousands of undetected cases subject to case-finding activities.

Nevertheless, the visible registers in the local health offices provide a count of the tuberculosis cases classified as known cases significant for public health supervision.

No consequential change occurred in the percentage distribution of the various types of tuberculosis in the 3 years that had elapsed since the first analysis (table 2). Each category showed a small decrease in number, the aggregate being 1,618. As previously noted, the known prevalence rate per 1,000 population decreased from 2.8 to 2.4.

There were some minor changes in the percentage distribution by stage of disease of pulmonary cases (table 3).

When the 1952 analysis was presented it was stated, "it is apparent that, with approximately 13,000 known pulmonary cases in the moderately and far advanced stages, tuberculosis in upstate New York requires continued efforts

Table 2. Number and percent of tuberculosis cases in visible registers by type, 1952 and 1955, New York State exclusive of New York City

| Tuberculosis type | 1952 | | 1955 | |
|------------------------|--------|---------|--------|---------|
| | Number | Percent | Number | Percent |
| All types..... | 19,923 | 100.0 | 18,305 | 100.0 |
| Pulmonary..... | 18,118 | 90.9 | 16,692 | 91.2 |
| Other respiratory..... | 938 | 4.7 | 843 | 4.6 |
| Other forms..... | 867 | 4.4 | 770 | 4.2 |

Table 3. Comparison of 1952 and 1955 percentage distributions of pulmonary tuberculosis cases, by stage of disease, New York State exclusive of New York City

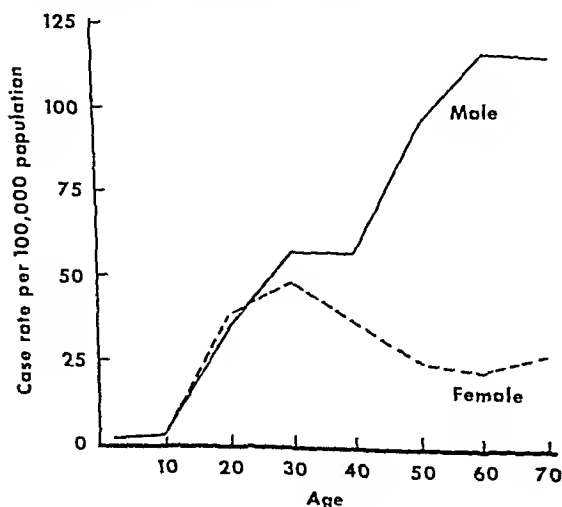
| Stage of disease | 1952 | | 1955 | |
|-----------------------|---------|---------|---------|---------|
| | Number | Percent | Number | Percent |
| All stages----- | 18, 118 | 100. 0 | 16, 692 | 100. 0 |
| Minimal----- | 4, 715 | 26. 0 | 4, 068 | 24. 4 |
| Moderately advanced-- | 7, 623 | 42. 1 | 7, 190 | 43. 1 |
| Far advanced----- | 5, 059 | 27. 9 | 5, 053 | 30. 3 |
| Not stated----- | 721 | 4. 0 | 381 | 2. 3 |

by all concerned with public health" (1). The only change needed to make this statement applicable to the 1955 analysis is to note that the number of cases is now only 500 less.

The 1955 analysis reemphasized that the tuberculosis problem is greatest among men, particularly those in the older age group. Males constituted 58 percent of the registered pulmonary cases in 1952 (9) and 62 percent in 1955. The number of males registered as tuberculous remained nearly the same. The rate per 1,000 population was 2.9 for males as compared with 1.8 for females.

The 1955 prevalence rate for women reached a peak at 30 years of age, at which point it was

Figure 1. Rates for newly reported pulmonary tuberculosis cases, 1954, New York State exclusive of New York City.



only slightly higher than the rate for men. The male rate rose to a peak at 60 years. These findings are similar to those of 1952 (9). The configuration of the 1955 prevalence rates was also similar to that of the newly reported pulmonary tuberculosis case rates for 1954 (fig. 1). Of 16,692 persons with pulmonary tuberculosis, only 126 were under 15 years of age.

The 1955 review of the registers also showed that far advanced cases accounted for 34 percent of the pulmonary tuberculosis among males as compared with 25 percent for females.

The men with tuberculosis are about 10 years older than the women, and persons with minimal extent are younger than those with advanced disease (table 4).

These findings substantiate data from other sources and point up the need for continued

Table 4. Median age of pulmonary tuberculosis cases, by sex and stage of disease, 1952 and 1955, New York State exclusive of New York City

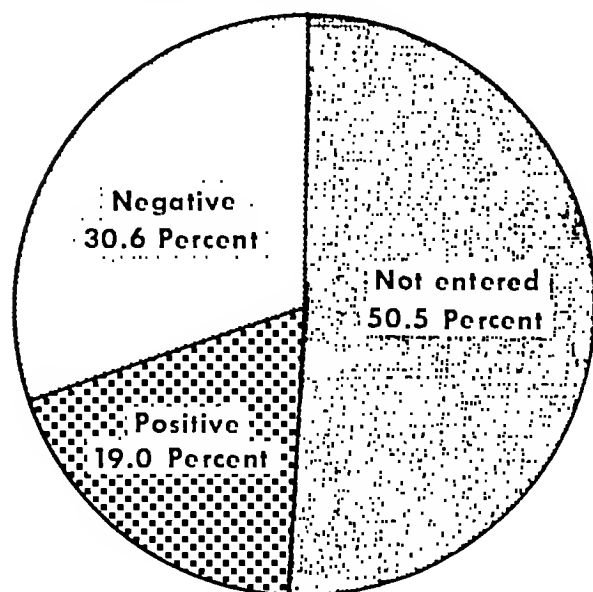
| Stage of disease | Median age in years | | | |
|-----------------------|---------------------|-------|--------|-------|
| | Male | | Female | |
| | 1952 | 1955 | 1952 | 1955 |
| All stages----- | 48. 4 | 50. 0 | 38. 2 | 39. 0 |
| Minimal----- | 45. 8 | 45. 7 | 36. 1 | 35. 6 |
| Moderately advanced-- | 49. 0 | 50. 4 | 39. 0 | 40. 1 |
| Far advanced----- | 49. 9 | 51. 4 | 38. 8 | 40. 2 |

and increased case-finding activities among men aged 45 or over.

Sputum Status

Of the 16,692 pulmonary cases on the local tuberculosis case registers in 1955, 3,166, or 19 percent, had a positive sputum in the previous 12-month period. During this same period, however, no sputum information was reported for 8,245 cases, or 50 percent (fig. 2). The percentage of cases with no sputum examinations was only slightly less than in 1952. Sputum examinations represent one of the most important items in case and contact supervision. Since facilities are available, greater

Figure 2. Sputum status of pulmonary tuberculosis cases, 1955, New York State exclusive of New York City.



effort to obtain sputum examinations and record the results are indicated.

Of 7,173 active or sputum positive pulmonary tuberculosis cases, less than half were hospitalized in 1955 (table 5). This is similar to the situation in 1952. Only slightly more than half of the 3,166 cases with positive sputum in the previous 12 months were hospitalized, practically no change since 1952. Is it not foolhardy to be complacent about tuberculosis while 3,740 patients who are either active or sputum positive, or both, remain unhospitalized where hos-

pital facilities are available? Of the 1,475 nonhospitalized sputum positive cases, 325 have never been hospitalized for tuberculosis. Nearly 300 of those hospitalized were treated for less than 6 months in hospitals.

As was pointed out in the 1952 analysis, "For many reasons, some more valid than others, it is difficult to hospitalize and keep hospitalized every case requiring hospitalization. Nevertheless, these reasons should be known and recorded and the number of cases in this category reduced for the welfare of the individual as well as that of the community" (10). It must be constantly remembered that these patients, even if under supervision, constitute a potential health hazard.

Nearly 1,000 active cases have no known medical supervision (fig. 3). Such cases certainly constitute a challenge in the control of tuberculosis. Systematic conference-type review of these cases by the local health officer, the clinician, and the supervising public health nurse could very well result in a significant reduction in the number of unsupervised cases.

Clinical Status

The clinical status, or activity at time of last report, of the 16,692 pulmonary cases in the active files is shown in figure 4. There were changes between 1952 and 1955, namely, a decrease in the percentage of "active" and "activity not stated" categories. Nevertheless, the clinical status of more than 3,000 cases was not stated or was undetermined.

Table 5. Sputum positive ¹ and other active pulmonary cases, by hospitalization status, 1955, New York State exclusive of New York City

| Sputum and clinical status | Number | | | Percent in hospital |
|---|--------|--------------------------|-----------------|---------------------|
| | Total | In hospital ² | Not in hospital | |
| All cases----- | 7, 173 | 3, 433 | 3, 740 | 47. 9 |
| Sputum positive in past 12 months----- | 3, 166 | 1, 691 | 1, 475 | 53. 4 |
| Active----- | 2, 413 | 1, 548 | 865 | 64. 2 |
| Arrested----- | 341 | 24 | 317 | 7. 0 |
| Inactive----- | 117 | 6 | 111 | 5. 1 |
| Not stated or undetermined----- | 295 | 113 | 182 | 38. 3 |
| Sputum negative or no expectoration, active status----- | 1, 024 | 369 | 655 | 36. 0 |
| Sputum not examined or no information, active status----- | 2, 983 | 1, 373 | 1, 610 | 46. 0 |

¹ Cases classified as arrested or inactive may have positive sputum.

² Bacteriological status at time of admission.

Knowledge of the clinical status of cases is not merely of academic interest but has definite administrative value. Clinical status, in addition to the stage of disease, laboratory findings, family conditions, and so forth, determines the amount of supervision the patient and his contacts require. During 1955, 107,406 public health nursing and bedside visits were made to tuberculosis patients and contacts, representing 14.6 percent of the total visits (11). With nursing time at a premium, an up-to-date register will enable the health officer to use nursing service more effectively and economically.

Hospitalization Status

With regard to the pulmonary cases classified by clinical and hospitalization status, the findings are not too dissimilar to those of 1952 (table 6). About one-quarter were hospitalized; of the active pulmonary cases slightly

Figure 3. Sputum positive and other active pulmonary tuberculosis cases not in hospital, 1955, New York State exclusive of New York City.

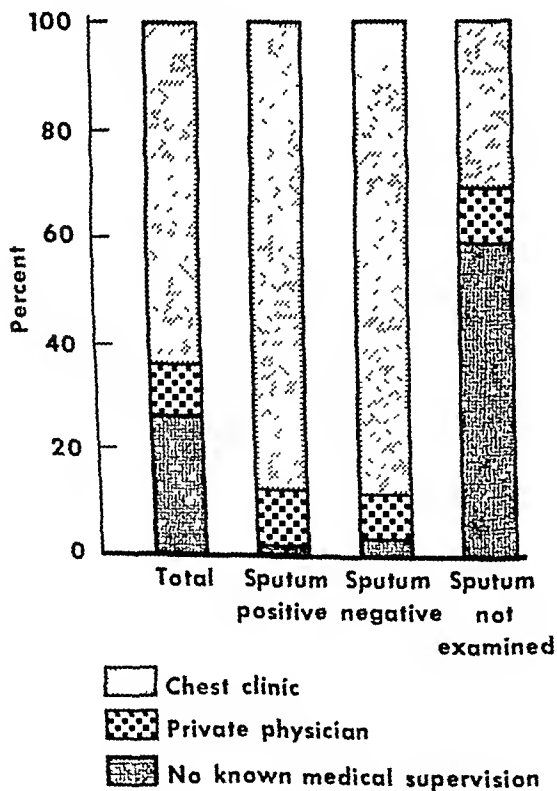
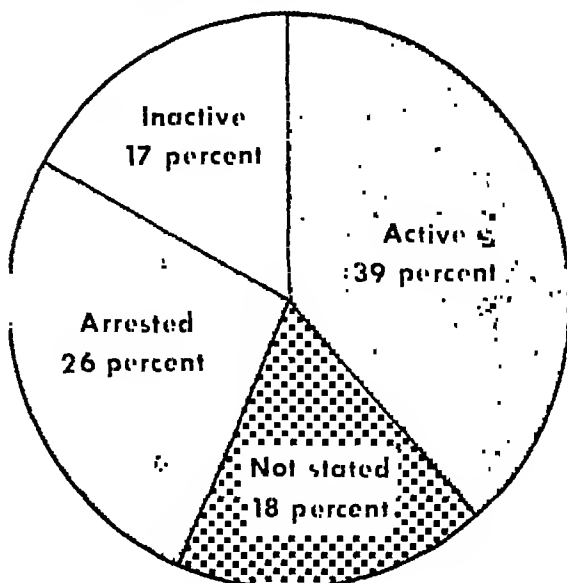


Figure 4. Clinical status of pulmonary tuberculosis cases, 1955, New York State exclusive of New York City.

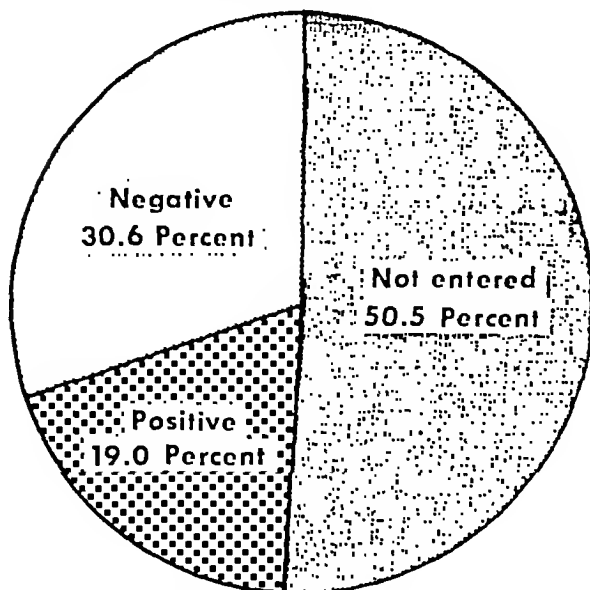


more than one-half were hospitalized. Of the nonhospitalized cases 25 percent were classified as active, 33 percent as arrested, 22 percent as inactive, and 20 percent not stated. Between 1952 and 1955 there was a decrease in the percentage of "active" and "activity not stated" groups. Nevertheless, the clinical status of nearly 2,500 nonhospitalized pulmonary cases was undetermined or not stated. Of these patients more than half were under chest clinic supervision and another 10 percent under the care of private physicians (fig. 5). It is recognized that there are delays in determining a patient's clinical status, but prolonged delays affect administrative decisions concerning contact examinations and nursing supervision. When such data are available and yet not entered on the visible register, the value of the register is vitiated.

Nearly 3,000 of the 12,585 nonhospitalized pulmonary cases were under no known medical supervision. About one-third of the 3,130 nonhospitalized pulmonary cases with active tuberculosis were under no known medical supervision (fig. 5). Since, by definition, a person on the register is in need of medical supervision, such unsupervised persons jeopardize their cure and rehabilitation and are potential spreaders of the disease.

Of 13,911 nonhospitalized cases of tubercu-

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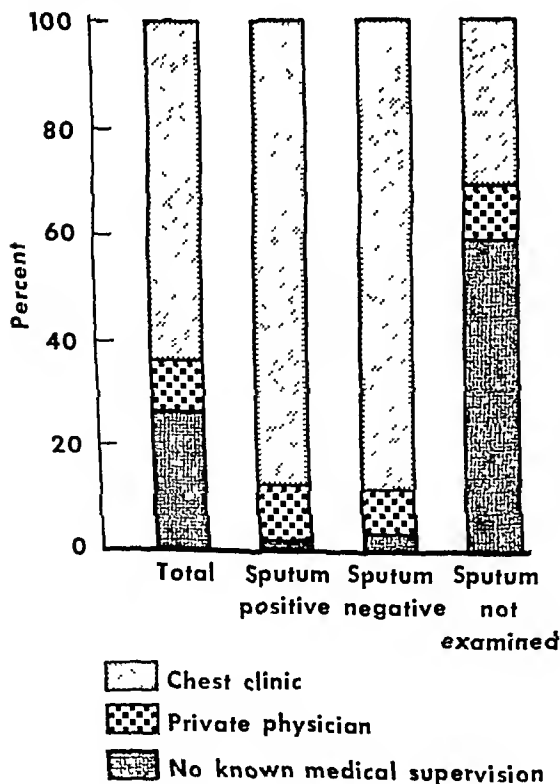
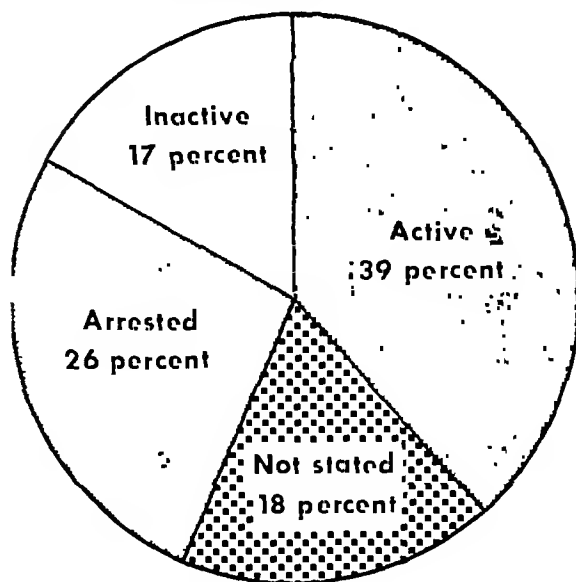


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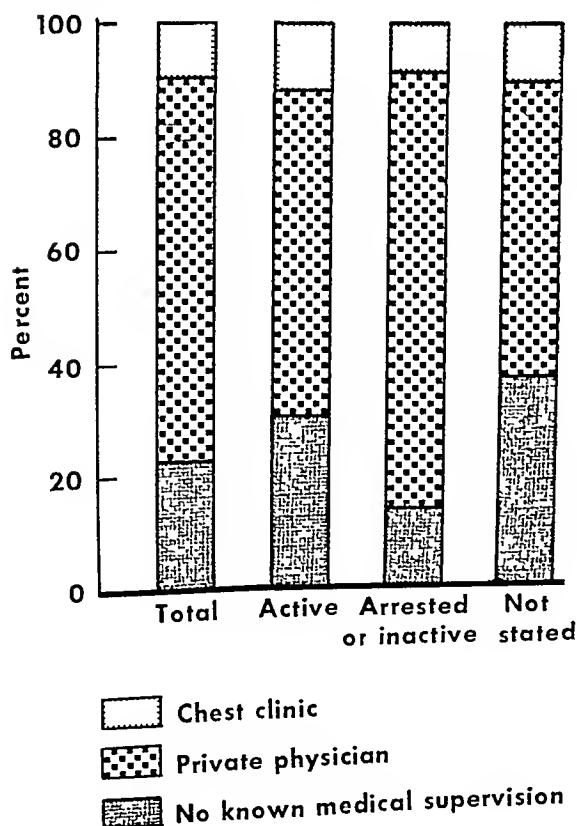
Of 13,911 nonhospitalized cases of tubercu-

Table 6. Pulmonary cases, by clinical and hospitalization status, 1955, New York State, exclusive of New York City

| Clinical status | Number | | | Percent by hospital status | | | Percent by clinical status | | |
|---------------------------------|--------|-------------|-----------------|----------------------------|-------------|-----------------|----------------------------|-------------|-----------------|
| | Total | In hospital | Not in hospital | Total | In hospital | Not in hospital | Total | In hospital | Not in hospital |
| Total..... | 16,692 | 4,107 | 12,585 | 100.0 | 24.6 | 75.4 | 100.0 | 100.0 | 100.0 |
| Active..... | 6,420 | 3,290 | 3,130 | 100.0 | 51.2 | 48.8 | 38.4 | 80.1 | 24.9 |
| Arrested..... | 4,336 | 132 | 4,204 | 100.0 | 3.0 | 97.0 | 26.0 | 3.2 | 33.4 |
| Inactive..... | 2,852 | 69 | 2,783 | 100.0 | 2.4 | 97.6 | 17.1 | 1.7 | 22.1 |
| Not stated or undetermined..... | 3,084 | 616 | 2,468 | 100.0 | 20.0 | 80.0 | 18.5 | 15.0 | 19.6 |

losis (all forms) 2,451 had not been clinically observed since 1952 (table 7). From such a large number of nonhospitalized cases, many of them active, and the large group of unsupervised cases, there arises the stark realization that much more remains to be done before

Figure 5. Clinical status and type of supervision of pulmonary tuberculosis cases not in hospital, 1955, New York State exclusive of New York City.



tuberculosis may be considered as completely controlled, much less eradicated.

Many of the patients not heard from for 12 months or more, and possibly even some with more recent cases, have undoubtedly moved away, died (without mention of tuberculosis on the death certificate), become lost, or have had inactive tuberculosis for the time period specified for transference from the administratively active file to the closed file. Some patients, despite positive sputum, may be considered as having attained maximum hospital benefit. And, of course, hospitalized patients on weekend passes with the extensive liberty to associate with such susceptible groups as young children may truly be more of a hazard than some nonhospitalized patients who are effectively isolated by geographic, economic, and social conditions.

Even so, substantial numbers of the supposedly known cases undoubtedly still have tuberculosis which has not been completely inactivated. In the light of new therapeutic approaches and surgical skills, many of them

Table 7. Year of last clinical observation of nonhospitalized tuberculosis cases, 1955, New York State exclusive of New York City

| Year | Number | Percent |
|------------------|--------|---------|
| Total..... | 13,911 | 100.0 |
| 1954-55..... | 9,982 | 71.8 |
| 1953..... | 1,478 | 10.6 |
| 1952..... | 788 | 5.7 |
| 1951..... | 501 | 3.6 |
| 1950..... | 338 | 2.4 |
| Before 1950..... | 824 | 5.9 |

have adequate space and a quiet time for doing clerical work? Are they given an adequate introduction to recordkeeping? Do they need courses in rhetoric? Is information requested that is not essential? Are field nurses aware of uses made of statistical information collected?

10. Are personnel policies at least up to the minimum standard recommended by the profes-

sional nurses' association in your community? How satisfactory are the policies about salaries, mileage rates for the use of personal cars, working hours, vacation, and leave? Can an employee who has served for many years get a 1- to 3-month leave of absence, other than for schooling, without loss of seniority or civil service status?

Program for Evaluating Heart Disease Drugs

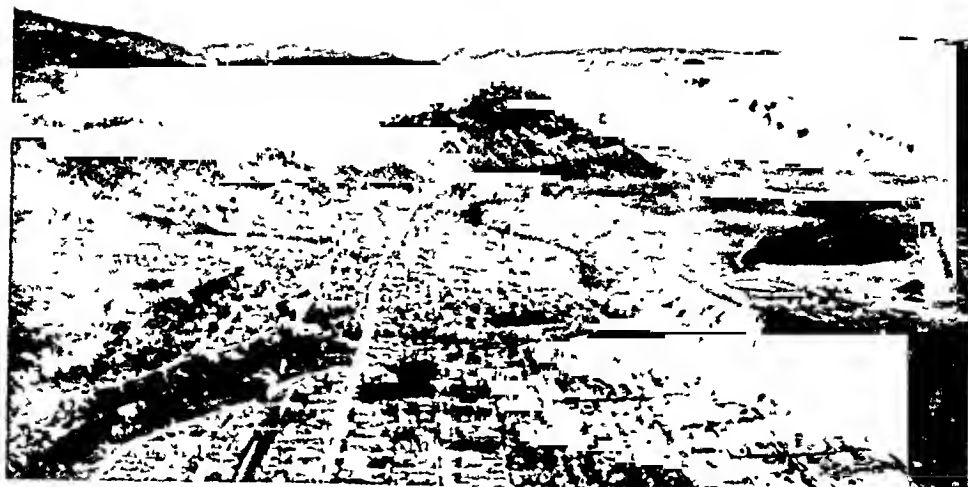
A grant of \$575,000 to evaluate the effectiveness of drugs used in heart disease treatment was awarded Dr. Alan E. Treloar, director of research of the American Hospital Association.

The research grant, the largest of its kind ever made by the National Heart Institute of the Public Health Service, will finance a nationwide program coordinating the work of a number of research teams, as yet to be selected.

The projected large-scale study involves a testing program to determine the most effective drugs, or combinations of drugs, and dosages among the many new forms of treatment developing in the heart field. Initial emphasis will be on hypertension.

Dr. Treloar and the American Hospital Association envision the formation of an advisory board to set up the program's guiding principles and to make broad policy decisions. The board will be composed of eminent medical research workers and clinicians; it is expected to include a representative of an appropriate committee of the American Medical Association and also of the American Heart Association.

A central staff located in Chicago will include a clinician and a biostatistician who will coordinate project activities and supply administrative and biostatistical services for investigators. Each hospital and clinical research laboratory collaborating in the program will provide a representative for a technical committee. This group will serve as a means for constant communication between the research teams and will determine details of procedure.



The San Juan Basin Plan

By GEORGE MOORE, M.D., M.P.H.

IN THE EVENT of a national emergency from enemy attack, the small cities, towns, and villages of America will save the populations of many of the larger industrial cities. This statement cannot be questioned since the primary targets in the United States include most large cities with their factories and congested populations. How can the small cities and towns in rural areas save their urban neighbors? The San Juan Basin of Colorado has attempted to provide an answer.

Some 33,000 people live in the San Juan Basin, a four-corner, 12,000-square-mile area flanked by the high mountain ranges of the Rockies. The basin is central to Albuquerque

in New Mexico, to Phoenix in Arizona, to Salt Lake City in Utah, and to Denver and Pueblo in Colorado. Distances to these cities range from 200 to 500 miles. Most east-west and north-south highways in this region of the southwest converge on Durango and Cortez, Colo., the basin's largest communities. Durango has a population of 12,000, Cortez, 5,000.

In the event of enemy attack, no target in the basin would be worthy of enemy bombs, but dangers do exist. Radioactive fallout from the bombed cities may drift over the basin. Enemy saboteurs may plot destruction of vital installations. Thousands of evacuees may seek refuge in our homes and hospitals.

The danger of radioactive fallout has been met by establishing in Durango, at a cost of about \$1,000, a detection station that houses a Staplex single-volume air sampler. Manned by a team of health department personnel, the instrument is capable of detecting minute amounts of radioactivity in the air before the danger becomes serious, thus providing hours of warning. It operates on 110-volt current or by a generator.

A weather bureau official computes the fallout patterns and relays his findings to our radio

Dr. Moore, director of the San Juan Basin Health Unit, Durango, Colo., is one of three physicians appointed by the San Juan Basin Medical Society to plan for medical care in an areawide emergency. An account of Dr. Moore's experience as chief public health officer, United States Operations Mission to Nepal, 1952 to 1954, appeared in the April 1954 issue of Public Health Reports, p. 340.

station for Conelrad broadcasts on 640 and 1240 AM frequencies. If, after an attack, the team should find that fallout is a serious hazard, civil defense officials could confidently call for withdrawal toward a safer area. Mass evacuation of the basin's families can thus be a leisurely and simple procedure.

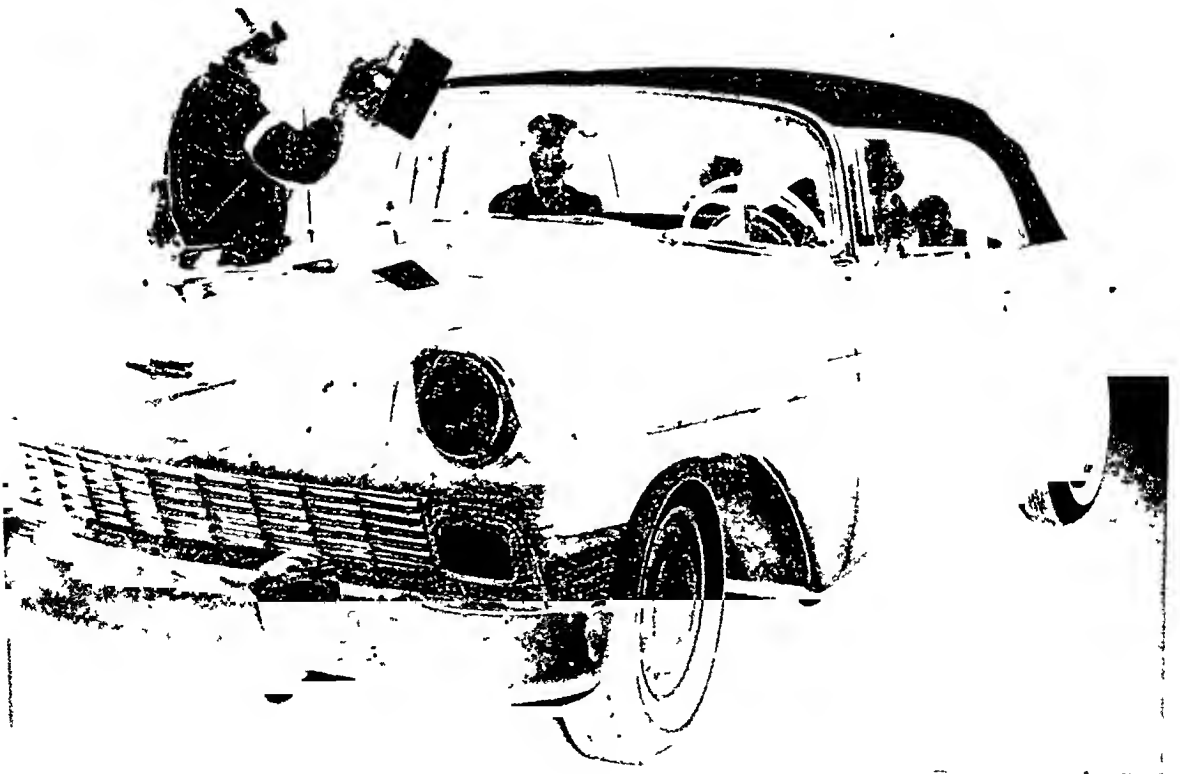
As to the second danger, we can expect that one-way bombers after their bombing runs from the north might land on the flat mesas and prairies of central and southwest States. We can also reasonably expect that airmen conversant with American customs and perhaps trained in sabotage will enter cities and towns unnoticed and mingle with the populace. Their job would be to foment panic, to set fires in forests and lumberyards, to destroy

bridges, powerplants, and oil dumps, and to contaminate water and food supplies with chemical and bacteriological agents.

A third problem, fraught with danger too, is the extent of our preparedness to receive and care for evacuees. If a city such as Albuquerque with a population of 160,000 has at least 3 hours' warning, it is expected that about 150,000 persons could be evacuated. Possibly 20,000 or more refugees will find their way northward across the desert to the mountainous San Juan Basin.

Many of these evacuees, hungry, desperate, sick, and afraid, might conceivably ransack and loot stores, gasoline pumps, and food warehouses, leaving nothing for evacuees or residents alike. And without further food and

for Small City Survival



stores for 3 weeks or more, the basin's inhabitants would themselves become victims of war. Therefore, an orderly reception of evacuees is necessary to insure help and rapid recovery for all.

The Fortress City

The survival plan is for Durango to consider itself a fortress in time of attack. At the flash of national alert, the city will go under civil defense authority, similar to martial law in many respects. All emergency teams will proceed to their stations.

Main highways leading into Durango will be barricaded with bulldozers and trucks, leaving detour routes around the city open for outside traffic as needed. All traffic within the city, except emergency and official vehicles, will be stopped. Places of business and service stations will be closed. Armed guards will be posted in front of food stores to prevent runs on supplies. School children will be sent home immediately. People will be warned to stay in their homes.

Thus, the city will be ready for attack, teams will be at their posts, and residents and workers will be at home waiting for Conelrad reports on their radios. In this period of waiting the public will ready their cars, fill tanks with stored supplies of gasoline, draw off water for storage, and prepare baskets of food. Conelrad in cooperation with the detection station will advise of fallout from bombed areas. If mass evacuation of the city is necessary, Conelrad will describe the routes to designated rendezvous points.

Reception of Evacuees

When the first evacuees arrive at Durango, they will be met at the roadblocks by the traffic control teams. If they prefer to detour the city, they will be offered a cup of coffee and a sandwich by a welfare team and then directed to follow the markers. Gas stations at each barricade will ration a few gallons of fuel, if needed, to each vehicle as long as the gasoline lasts.

For the 20,000 evacuees who prefer to stay in Durango, a different procedure is planned.

These individuals will be met at the barricades by monitoring teams who, with geiger counters and ionization chambers, will check for radioactive fallout dust. Vehicles found to be radioactive will be either left outside the barricade or motioned on toward the detour, as the occupants prefer. Vehicles found free from contamination are then screened by the police for saboteurs. Luggage and identification will be checked thoroughly before either a vehicle or person is permitted to pass the barrier. Arrangements have been made for the care of pets.

Each barricade will have a mobile first aid team led by a physician. The team will send injured and ill evacuees, by ambulance or truck, to one of three first aid centers temporarily established in the Durango public schools. The injured and sick will be treated at the first aid stations and then either transferred to a hospital or released to one of five registration centers. The healthy evacuees will be directed to a wide parking expanse where traffic teams will park the cars in an orderly fashion. Radios at the barricade will keep the teams informed of possible new dangers.



"Saboteur" found on public street by Durango police during simulated alert, July 1956.

At the parking lot, the evacuees, carrying their luggage, will board school buses waiting to shuttle them to the registration centers. The centers are to be located in public buildings central to each of five main sections in the city. They will be manned by volunteers and welfare officials. After registration, evacuees will be sent on foot, in company with boy scouts or uniformed guides, to their assigned quarters in the homes of residents. A list of available rooms is ready in anticipation of this maneuver.

In the interim, the fire department will have been waiting for emergency calls, and the police department will have stationed guards at bridges, gas depots, water works, and other vulnerable sites. Factories will have assigned men to guard industrial targets. The relative absence of street traffic will simplify the job of safeguarding people, homes, and key targets. Likewise, the detection of looters and saboteurs will be less difficult.

The next morning should see Durango intact with all evacuees received and placed. The care and conservation of what is left then begins.

Realistic Planning

A full count of evacuees and an inventory of food, clothing, gasoline, and medical supplies will determine how the city will live for the next few weeks. Health officials will check water and food for possible contamination and will try to maintain near normal services. Twice a day, volunteers and welfare and health personnel will set up food lines at the fairgrounds and at large restaurants.

For supplementary needs the granges have accumulated stores of extra supplies of canned food, fruit, potatoes, and gasoline. These will be rationed as needed. At any time, we could supply 25,000 to 30,000 pounds of milk, 25,000 head of beef cattle, 60,000 sheep, and 1,000 hogs. Flour, pinto beans, and grain are abundant. Food, therefore, should not be a problem.

If the watershed becomes contaminated with fallout, we would have enough stored water, once the reservoir is covered as planned for 1957, to last evacuees and residents 3 weeks. Water supplies have been tremendously improved this year over last by the addition of



Sheriff and civil defense aide find "bomb" under oil tank in Durango suburban area.

a new filter plant in Durango. Water during most of the year is plentiful. Most farms have wells, and water will be transported to the cities as needed. Our fast-flowing streams could in warm weather decontaminate most of the watershed within a week. Sewerage, though inadequate, also has top priority in city budgeting.

The police and firemen in Durango have been trained by former Army servicemen in many types of counter sabotage. The police and fire departments held an impressive operation alert in July 1956 together with civil defense teams, health department personnel, and amateur radio operators. The exercise simulated a realistic emergency complete with enemy agents plotting to contaminate water, incendiary fires ignited in army-type smoke pots, and time bombs planted at strategic sites (see pictures).

During an alert, auxiliary police will patrol the filter plant and reservoir, and our sanitation staff will stand by for any emergency. Continuous check will be made on the water for turbidity, changes in pH, presence of bacteriological agents, and deposits of radioactive fallout if it is a problem. The small laboratory of our health department and the technician in charge are well equipped and well qualified to make bacteriological examinations. We hope to acquire a millipore filter soon.

All of the health department staff have received special training in civil defense through courses in Denver and in Washington. They in turn have helped to train civil defense work-

ers in Durango (see program). The monitoring teams have been trained in food and water decontamination. The fluorescent antibody and phage tests for rapid bacteriological diagnosis as well as complete kits for CW (chemical warfare) sampling will be added to our program as soon as these materials are released. At present, public health defense against BW and CW attacks is not particularly effective until the specific agent is determined and after people are already sick and dying.

The San Juan Basin Health Unit now has a full year's determination of background counts on radioactive fallout. The Colorado State Health Department gave valuable assistance in calibrating the air sampler and in training health personnel in radiation detection. The weather bureau official who will chart and relay fallout reports was sent to the Sandia Corporation in New Mexico for special training.

Natural and Wartime Disasters

The survival plan will utilize every available inch of space in the hospitals as well as in auxiliary buildings. The only hospitals in the basin are the two hospitals in Durango and the hospital in Cortez. Altogether we count on having 300 hospital beds, 25 physicians, 6 dentists, 4 veterinarians, 185 first aid workers, and about 150 nurses and aides. All available nurses have been listed. If disaster strikes a nearby city, a team of 6 physicians with nurses and helpers and supplies is ready for call.

A move has been made to bring Federal Civil Defense Administration stockpiling to the basin because of the remoteness of the stockpiles in Texas and Utah and at Greeley, Colo. All hospitals are stockpiling medical supplies and rotating perishable items. Eventually, their stockpiles will hold a year's supply in advance.

Vaccines and serums are not being stockpiled to any great extent because it is not in our present plan to offer immunizations to the public at large. The health unit has been attempting to provide mass immunization through school programs. Immunization levels among school children are well over 85 percent for smallpox and diphtheria-pertussis-tetanus.

Civil Defense Training Course

San Juan Basin Health Unit

First Day

Strategic briefing of civil defense.

Effects of modern weapons. Films "Let's Face It" and "Operation Ivy."

Nuclear weapons and radiation detection instruments. Film "A Is For Atom."

Evaluation of radioactive fallout hazard.

Biomedical effects of radiation.

Chemical warfare.

Bacteriological warfare.

Films "Flash of Darkness" and "Target You."

Evening

Films "Atomic Attack" and "Frontline of Freedom."

Second Day

Civil defense analysis.

Attack warning. Film "Conelrad."

Civil defense organization.

Organization of health services, casualty care, health and medical supply program, and the improvised hospital.

Durango as a typical support area, urban analysis.

Evacuation, shelters, and cover. Films "Escape Route" and "Operation Welcome."

Rescue training. Film "Trapped."

Registration and warden services.

Police and traffic services.

In addition, the Indians in the basin are now protected with typhoid-paratyphoid vaccine.

We have tried to be realistic in planning for various types of casualties. In addition to screening evacuees for communicable disease, we have made specific provisions for isolation of disease suspects at first aid stations, for the use of churches and churchmen to help alleviate hysteria and panic, and for hospitals to set aside wards for radiation victims. Evacuees with burns, fractures, amputations, and other serious conditions are not expected in great numbers because of the basin's distance from target areas. They may be sent here later, however.

Of course, no one knows how many evacuees the basin might receive, but, for our planning, a total of 20,000 has seemed a practical number to assume. Durango, with new discoveries of oil, gas, and uranium, has become a boom town since the war. Housing is at a premium, and most new homes are ranch style and small. We would have trouble accepting more than 20,000 new people, but if we had no choice, we would use barns, rodeo facilities, and all available public buildings.

Considerable interest has been expressed in our plan. A mutual aid pact is being drawn up with Farmington, N. Mex., the first large city south on the road to Albuquerque. Farmington will detour evacuees to us as we will to them if cities to the north of Durango are bombed. Other cities in Colorado and New Mexico and even in South Dakota have shown interest in organizing similar programs. It

has been obvious that the public is worried about the future and will work enthusiastically if we lead the way and provide hope.

The basin also has an alternative emergency plan that covers the natural disasters any community might experience from train wrecks, fires, collapsed buildings, and flood. Not more than 50 casualties are expected from any one isolated incident. These we will care for by using the maximum available beds in the basin's hospitals. The hospitals are prepared, as needed, to reroute their patients and to provide morgues and extra dispensary space. Physicians have specific assignments.

Not at all phases of both plans are complete, but we trust that the ^{city} ^{of} ^{the} ^{basin} will be ready for whatever comes, natural and war disasters alike.

NOTE: The photographs were supplied through the courtesy of Pennington Studio, Durango, and the *Durango Herald News*.

idea

The Personal Touch

Though approximately 400 persons receive postgraduate training in public health every year, the profession is probably losing between 600 and 700. States fortunate enough to have a reasonable number of public health workers have usually obtained the greater proportion from adjoining areas.

Our replacement needs and the additional workers needed to meet the demands of a growing population have to be viewed realistically in the light of the decreased supply of young people, brought on by the reduced birth rate from 1930 to 1941, and of the many inducements that are currently offered to them.

Industry's profits at the moment are of such magnitude in relation to

the tax structure that industries can afford to pay salaries to professional personnel for beginning employment in ranges that industries themselves recognize are greater than the employee is actually worth.

Training for public health work, usually provided from public funds because it primarily benefits the employer, has declined appreciably because of cuts in Federal grant funds. Some States have been reluctant to finance training or have been unable by law to do so. Thus, the cost of preparation is devolving upon the individuals themselves even though financial compensation, when employed, does not compare favorably with that of industry.

Since competition for personnel is so keen, I would like to suggest that there is a common need for bringing to seventh, eighth, and ninth graders some concept of the many interesting things that can be done in public health work. I would encourage maximum sensitization of this

group through whatever channels you can use to reach them. Perhaps too few of us have thought about the influence we could have by working actively in such groups as the Boy Scouts and Girl Scouts and the Hi-Y and 4-H clubs.

The most effective recruitment program I have seen for getting young ladies into a nursing school was one in which each student was given the responsibility for seeking out some worthy successor from her former high school and giving her a pledge pin.

Our recruitment programs must be personalized if they are to be effective.

—HAROLD M. GRANING, M.D., regional medical director with the Public Health Service, Region 5, Chicago, in a speech at the annual meeting of the Middle States Public Health Association, Columbus, Ohio, April 30, 1956.

technical publications

Diabetes Program Guide

PHS Publication No. 506. 72 pages. 45 cents.

State and local workers in diabetes control activities will find in this compact guide a complete presentation of the principles and procedures of community diabetes programs, starting with community resources and proceeding through prevention to case finding, education, evaluation, and research.

Emphasis is placed on working with statistical and laboratory procedures treated in some detail.

Criteria of success in diabetes programs are stated as: finding unrecognized diabetics and following them to diagnosis and treatment; helping prevent or correct obesity; helping diabetics control their condition under medical supervision; promoting the understanding of diabetes through individual and group education; and mobilizing community resources.

Included are forms and form letters, seven pages of references, and a detailed section on the cost of screening, with data on both laboratory costs and personnel.

Your Child from One to Six

Children's Bureau Publication No. 30. Revised 1956. 110 pages; illustrated. 20 cents.

This revised bulletin for parents emphasizes the mental and emotional development of children from infancy to school age.

The problem of television viewing is discussed for the first time. Other new sections point out how a child can learn to do without its mother, how to prepare a child for hospitalization, and what to tell a child who asks about death.

A comprehensive medical section tells how to handle emergencies, how

to care for a sick child, and how to prevent and recognize illness. Also provided is a complete immunization plan for children from one month of age throughout childhood.

Public Health

Merit Badge Series No. 3251. 1956. Boy Scouts of America. 66 pages; illustrated. 25 cents.

A new version of this pamphlet has been prepared in association with the Public Health Service. Designed to help Boy Scouts qualify for a merit badge, it is also an elementary introduction to basic concepts and programs of the public health profession.

Sources of Morbidity Data, Listing Number 4, 1956

PHS Publication No. 504. 1956. 74 pages.

The fourth listing of projects in the files of the Clearinghouse on Current Morbidity Statistics Projects contains descriptions of 102 projects, supplementing the 477 described in listings Nos. 1, 2, and 3 (PHS Publications Nos. 332, 399, and 459).

There are three indexes: the projects by type of data collection; the organizations and institutions participating in the projects, by State; and the principal investigators. Also included is a section of supplementary notes representing a systematic followup on projects in the previous listings that were in progress when their descriptions were received by the clearinghouse.

Because the listings of the clearinghouse are published primarily for the use of actual and potential contributors, the number of bound copies available for other distribu-

tion is limited. Tear sheets for all projects are on file, however, and these will be mailed free of charge to persons inquiring about studies of a particular type.

Federal Support for Science Students in Higher Education, 1954

National Science Foundation Publication No. 56-18. 33 pages. 30 cents.

Designed to assist in evaluating proposals for federally financed scholarships in the sciences, this report provides information on present Federal aid to college and university science students.

It shows how much of the expenditure (in the form of fellowships or otherwise) in each program went to students in the various scientific disciplines; how many career science students were assisted; which Federal agencies were involved; how the various forms of financial aid were distributed among those studying in scientific fields; and, how, among the fields of study at graduate level, the federally aided group of science students compares with the nationwide graduate student body in the sciences.

Data on students in nonscience fields are included in the aggregate only for comparison.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Film an Educational Aid In New Mexico's Venereal Disease Program

By BERNARD F. ROSENBLUM, M.D., M.P.H.,
and WILSON A. CORCORAN, B.A.

NEW MEXICO, in 1955, ranked sixth in reported cases of syphilis. For the young age groups, those aged 15 to 25 years, the significance of the venereal disease problem in the State is shown by the figures for that year and for 1954.

For 1955, in the age group 15 to 25, there were 212 cases of syphilis, 797 of gonorrhea, and 9 of chancroid, a total of 1,018 cases of venereal disease of all types. This was 40 percent of the total of 2,609 for the State. For 1954, the total was 2,533 cases, of which 1,108, or 44 percent, were in the group aged 15 to 25 years.

When the film, "The Invader," was shown to the staff of the New Mexico Department of Public Health, it was agreed that here was an excellent film for use in our venereal disease educational program. It was particularly suited to the age groups we wished to reach. The film was previewed at different showings by the New Mexico Parent-Teacher Association officials, the Catholic Archdiocese, and the Ministerial Alliance. All were impressed, and gave their approval and endorsement for "The Invader" to be shown to any and all groups, including public, parochial, and private schools.

A letter was sent to all local school and parent-teacher association officials telling them of the venereal disease conditions in the

Dr. Rosenblum and Mr. Corcoran of the Public Health Service Venereal Disease Program are with the New Mexico Department of Public Health, Santa Fe, N. Mex. Dr. Rosenblum is venereal disease control officer and director of the division of preventive medicine. Mr. Corcoran, a health program representative, is also assigned to that division.

This paper was presented at the First International Symposium on Venereal Diseases and the Treponematoses, Washington, D. C., May 28-June 1, 1956.

State and of the proposal to use the film, "The Invader," as an integral part of the health department's approach to the problem. The letter included a short paragraph about the contents of the film and stated that it had been previewed and unanimously approved by the State Parent-Teacher Association, the Catholic Archdiocese, and the Ministerial Alliance. It was suggested that the local parent-teacher association preview the film one evening and present it to the students the following day. A mimeographed list of the 20 questions most commonly asked about venereal disease was enclosed, for presentation to the students prior to their viewing the film. The questions were in a "true or false" form, and the student was not required to sign his name but to give only his age, sex, and grade in school. The letter requested dates and alternate dates of the parent-teacher association meetings.

Response was immediate and overwhelming. The health department was swamped with requests for the film. With only one print on loan from the Venereal Disease Program of the Public Health Service, we were in need of additional prints if we were to carry out the educational program, including the showings of "The Invader," within a 12-month period. One print was purchased, and we prevailed on the Regional Office of the Public Health Service in Dallas, Tex., to lend us another print. With three prints to be divided among a field staff of five, stationed from 200 to 300 miles apart, and the home staff of two, the three films had to be scheduled to arrive at the right time and the right place for a 2-day stay and then be sent to the next showing. Coordinating the logistics on these procedures required the combined efforts of the home and field staffs. Because mail service is often delayed in New Mexico, the prints were sent by public interstate buses. This means of transportation is widely used in New Mexico and offers more frequent and better service to remote areas than do the railroads in transporting mail and freight.

At parent-teacher association meetings, "The Invader" was presented by a member of the health department staff, usually one of the trained venereal disease investigator-interviewers or, rarely, by a public health nurse. The usual procedure was to give a 5-minute

"The Invader"

"The Invader" is a film history of syphilis from the Renaissance to the present day. The pictures and text tell of the 400-year search of scientists for a cure for syphilis, of the discovery of penicillin by Fleming in 1928, and of Mahoney's work with penicillin which resulted in the announcement in 1943 that a cure for syphilis had been found. The film also gives an account of the fight for open discussion of syphilis so that syphilitics can be reached and the "chain of infection" broken.

The informative Film Guide for Teachers and Discussion Leaders issued by the division of instruction of the Georgia Department of Education states that the film "leaves the viewer with the feeling that everyone has a part in helping to conquer syphilis" and that "the surest control of syphilis comes from the integrity within that makes a man or woman live by decent values."

introduction, usually confined to the venereal disease situation in the State, with a few words about the length of the film. The audience was told that a question period would follow the showing of the film.

The following day, when the program was presented to students, usually boys and girls together, the introduction contained the statement that syphilis is a communicable disease and that the program was being presented on that basis and not on the basis of sex education. The students were told that a question and answer period would follow the film and also that the correct answers to the 20 questions distributed earlier would be given. These question lists, which were preferably completed a day or two prior to the showing of the film, were collected by the person showing the film and later were forwarded to the State health department for tabulation. A program has yet to be completed during which the students did not ask questions, such as, "Is there any vaccine for immunity to syphilis?" and, "Can syphilis be inherited?" Almost everyone expressed the opinion that they had learned many things they had not known before, and that they had enjoyed the film.

Some "do's" and "don'ts" may be of value in presenting this film. In making final schedules, make sure that the time does not conflict with a local basketball game, baseball game, or other event, or the program will be presented to an empty hall. When the film is to be shown to several schools in the same community, a local movie theater may be used, thereby saving precious time and personnel. It is wise to carry a projector and a screen and an extra 50 feet of extension cord. Frequently, the projector provided by the school or organization has something wrong with it, and unless a workable projector is on hand, the program will be a failure. Care should be taken to rewind the film after each showing. It is embarrassing to begin a new showing of the film and have to stop and rewind it, thus losing the attention of the audience. When making arrangements to ship the film to another location, the task of transportation should be delegated to a responsible person or the film may be mislaid and delayed, disrupting the schedule.

Through these methods and efforts "The Invader" was shown to 68,229 persons during September 1955-June 1956. The film was seen by the students and faculty of public, parochial, and private junior and senior high schools; civic groups, such as PTA's and miscellaneous clubs; and military personnel, as follows:

| | High schools | Civic groups | Military personnel |
|------------------------|-----------------|-----------------|-----------------------|
| Attendance..... | 33,791 | 19,500 | 14,938 |
| Number of groups..... | 129 | 207 | 5 |
| Number of showings.... | 273 | 207 | 54 |

The following suggestions may help in planning future programs:

1. The film should be prepared with commentaries in several languages. A Spanish commentary would be useful in New Mexico.

2. If the film could be shortened it could be used advantageously for television showing. It is very difficult and expensive to get television time, and "The Invader" runs 37 minutes, making it awkward to fit the pattern of 30-minute TV programs. A 20-minute showing, with an 8-minute discussion, would make a 30-minute program with 2 minutes for the announcer.

Because of its success in New Mexico, we recommend showing "The Invader" as an integral part of a venereal disease education program.

Contributions of Premarital and Prenatal Blood Testing in Syphilis Control

By HAROLD J. MAGNUSON, M.D., JAMES F. DONOHUE, M.P.H., JOHANNES STUART, Ph.D.,
and GERALDINE A. GLEESON, A.B.

MUCH OF THE PROGRESS in syphilis control during recent years has been accomplished through the cooperative efforts of the national venereal disease control program, State and local health departments, and various private agencies. The control measures and techniques used by these health agencies form such a closely integrated system that it is difficult to break down the contributions of certain components or to evaluate the efficiency of specific control measures. However, in this report two segments of the program, namely, premarital and prenatal blood-testing legislation, have been isolated, and an attempt has been made to measure the specific accomplishments of required blood testing.

Aside from the case-finding aspects of required blood-testing programs, the primary purpose of premarital and prenatal blood testing is to preserve the health and welfare of the family unit by preventing the transmission of

syphilis to marital partners and by protecting unborn children from infection with congenital syphilis. Such blood testing also has its educative values.

One of the most immediate results of effective premarital and prenatal blood-testing legislation should be reduction of infant mortality due to syphilis. But since there has been a general downward trend in infant mortality from syphilis during the past 20 years, it is difficult to determine by observation alone whether this reduction in rates would have occurred regardless of blood-testing legislation, or whether there is a definite relationship between the two factors.

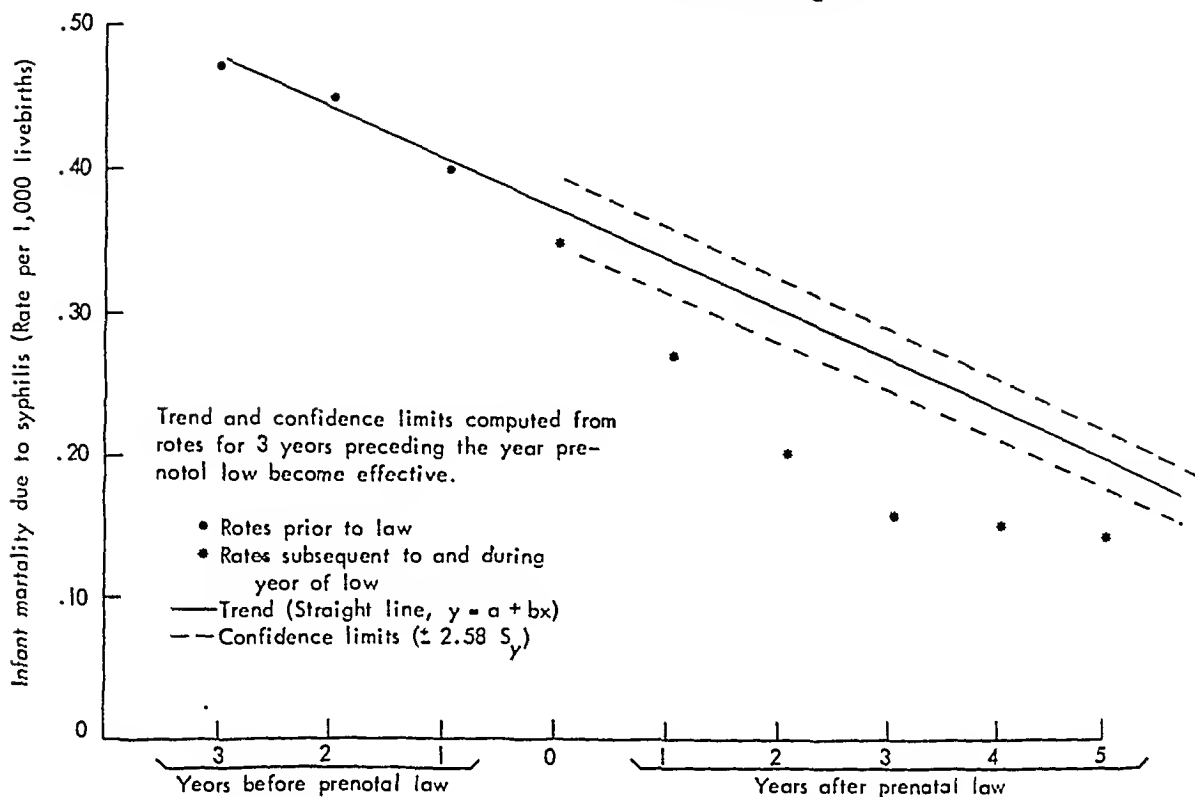
In an attempt to distinguish between the reduction in infant mortality due to blood-testing legislation and the general downward trend in infant mortality, composite rates per 1,000 live births for infant deaths due to syphilis were computed for States having prenatal blood-testing laws during 3 years prior to the year the law became effective. Assuming these three yearly rates to be representative of the general trend of infant mortality due to syphilis immediately preceding the passage of the law, a straight line trend ($a + bx$) was fitted to these rates and then extended through 5 years following prenatal legislation. Confidence limits at the 1 percent level of significance were set up about this extended line to allow for chance variation. The actual observed rates were plotted for the 5 years.

Figure 1 shows that the observed infant mortality rates for all years are significantly lower

Mr. Donohue and Dr. Stuart are chief statistician and program management officer, respectively, Venereal Disease Program, Public Health Service. Dr. Magnuson, chief of the Occupational Health Program, and Mrs. Gleeson, a statistician with the Air Pollution Medical Program, were formerly with the Venereal Disease Program, Dr. Magnuson as chief of the Operational Research Section and Mrs. Gleeson as a statistician.

This paper was presented at the Third Biennial Planning Conference of the Association of State and Territorial Health Directors, Washington, D. C., May 25, 1956.

Figure 1. Composite rate of infant mortality due to syphilis in 42 States before and after enactment of prenatal blood-testing law.



than the expected trend based on rates prior to blood-testing legislation. As a specific contribution to syphilis control, it is estimated that through the effectiveness of prenatal blood testing 1,000 infant deaths from syphilis were prevented in 42 States during the first 5 years following enactment of the law. Since 30 of the 42 States with prenatal blood-testing laws had enacted these laws during 1943, or earlier, the interval represented in the 5-year period is largely coincident with the war years and the immediate postwar years. This reduction in infant mortality due to syphilis becomes even more remarkable in view of the fact that it was accomplished during a period when infections syphilis case rates among civilians were at a peak and before penicillin became available for civilian use. This points up the vital importance of the operation of required blood-testing programs before, during, and after national crises which boost the rate of venereal disease infection.

The procedure used in evaluating the effectiveness of prenatal blood testing was also

used in examining the efficiency of premarital blood testing. Figure 2 shows that, except for a longer time interval, rates are essentially the same as would be expected before the reduction in infant mortality rates became readily apparent.

Prenatal Testing

To investigate the effectiveness of prenatal blood testing in individual States, the trend established by pre-law rates was related to post-law rates in each of the 42 States having prenatal blood-testing legislation. The results were as follows:

1. Fourteen States had an upward trend in infant mortality from syphilis during the 3 years preceding the effective date of the prenatal blood-testing law. After the passage of the law, all of these States had a downward trend in infant mortality from syphilis and experienced significantly lower rates than expected during 5 years following prenatal blood-testing legislation.

2. Two States with a steady level of infant

mortality due to syphilis during the 3 years preceding passage of the prenatal blood-testing law had significantly lower rates than expected during the subsequent 5 years.

3. Twenty-six States had a downward trend of infant mortality due to syphilis during the 3 years preceding prenatal blood-testing legislation. In all of these States the trend in infant mortality due to syphilis continued downward in the years immediately following legislation, in 7 at a faster pace than expected; in 6 at approximately the pace expected; and in 13 at a slower pace than expected.

As an example of the enactment of a prenatal blood-testing law resulting in decreased infant mortality due to syphilis, the observed rates in relation to expected trend are shown in figure 3 for the State of New Mexico. The significant decrease noted during the years 1950-53, following the passage of the law in 1949, is even more remarkable in view of the fact that New Mexico has for some years had the highest rate of infant mortality from all causes in the United States.

It might be asked if the accelerated decrease in infant mortality due to syphilis was confined to States with required prenatal blood-testing legislation or if States without such legislation experienced a comparable reduction in infant mortality rates. Since there is no date of law enactment to use as a point of reference in establishing an expected trend of infant mortality from syphilis in States without prenatal or premarital blood-testing laws, the selection of a year from which to project such a trend becomes fairly subjective. However, the observed trend line for areas without such legislation shows a gradual reduction in infant mortality from syphilis from 1936 to 1950, but how much more of a reduction would have occurred during these years if blood-testing legislation had been in operation is a matter of conjecture.

In addition to the reduction in infant mortality due to syphilis there is evidence to indicate that prenatal blood testing makes a definite contribution to the control of infant mortality from all causes. Presumably this is accomplished by bringing many expectant mothers to prenatal

Figure 2. Composite rate of infant mortality due to syphilis in 40 States before and after enactment of premarital blood-testing law.

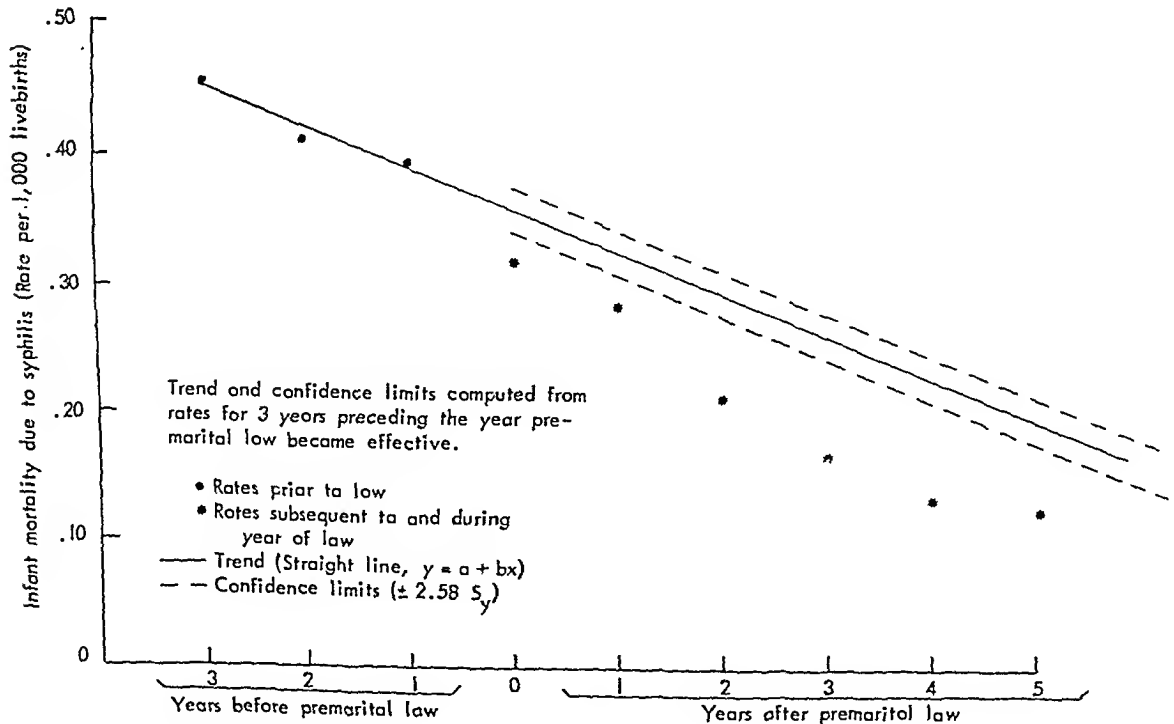
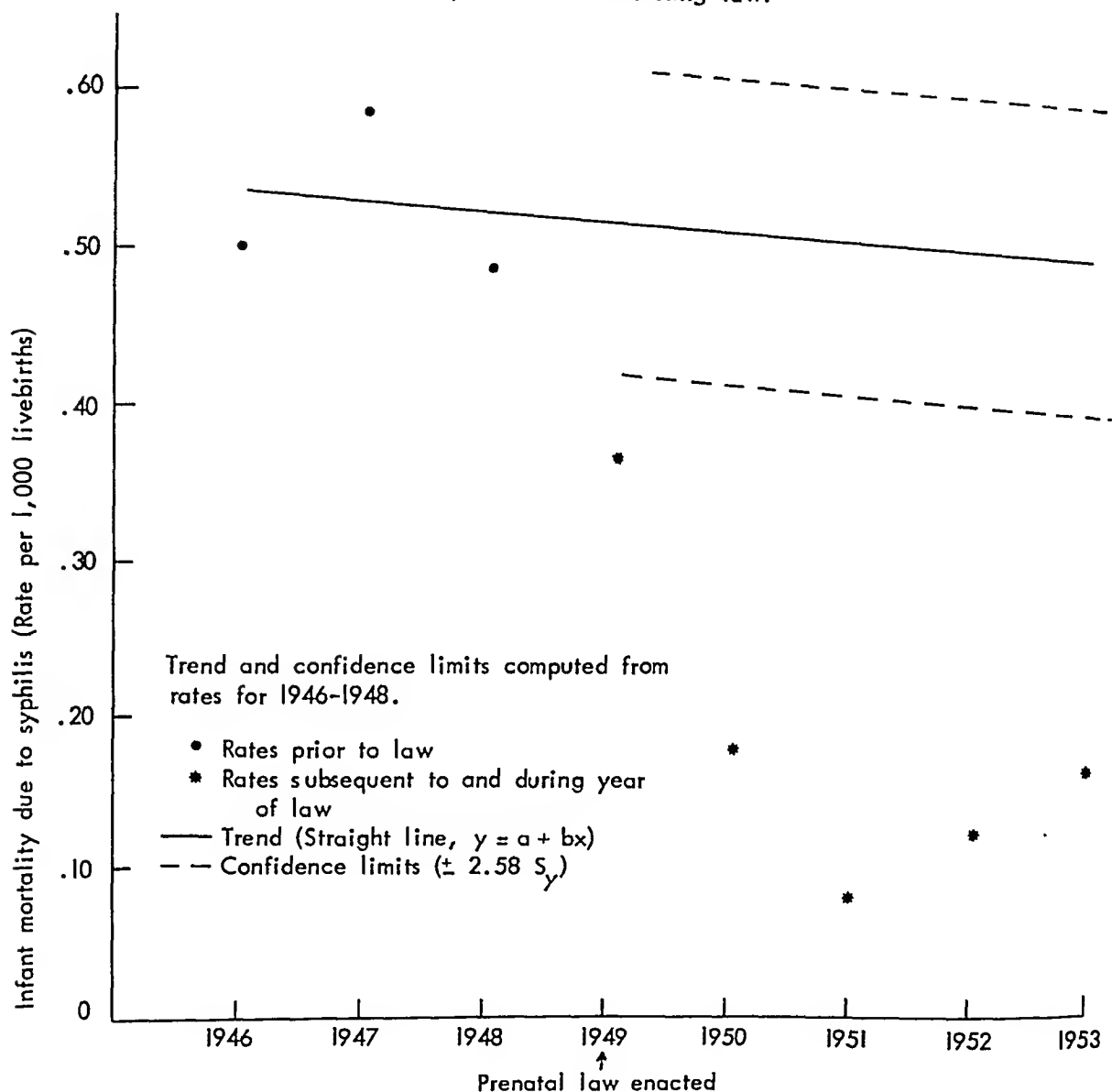


Figure 3. Rate of infant mortality due to syphilis in New Mexico before and after enactment of prenatal blood-testing law.



care which they probably would not obtain otherwise.

For the years 1951-53 the total infant mortality rates were significantly lower in the group of States with prenatal blood-testing laws. Since the States without these laws are not those with unreasonably high infant mortality from causes other than syphilis, it seems reasonable to assume that the lower infant mortality in States with prenatal blood-testing laws may have been due at least in part to increased

prenatal care incident to the required blood-testing program.

Race Distribution

Race distribution is, of course, a very real factor in measuring infant mortality. To determine the results of prenatal blood testing, specific for race, we have prepared some comparative material on areas with and without the law with varying percentages of white population. The 7 areas without prenatal

laws (6 States and the District of Columbia) happen to cluster in 3 geographic areas where white births comprise the following percentages of total births: 63 percent in Alabama, Tennessee, and Mississippi; 75 percent in the District of Columbia and Maryland; and 98 percent in Minnesota and Wisconsin. Total infant mortality in neighboring States with a prenatal blood-testing law and of a comparable proportion of white births was compared with the total infant mortality in these three areas. In every case, regardless of race distribution, the infant mortality rate among the white population was lower in 1953 in States with the prenatal blood-testing law than in States without such a law. Conversely, in all instances, the nonwhite infant mortality rate was higher in States with the prenatal blood-testing law than in States without this law, with the differential becoming greater as the number of nonwhites in the population decreased.

There may, of course, be a number of factors contributing to this paradox among nonwhites. One factor is the administration of the law. This was borne out by a study of New York City birth certificates which asked whether a prenatal blood test had been made (see table).

Results of a study on prenatal care in New York City, 1951

| Race | Number of births | Late or no prenatal STS | |
|-------------------|------------------|-------------------------|---------|
| | | Number | Percent |
| White..... | 4, 905 | 639 | 13. 0 |
| Puerto Rican..... | 521 | 228 | 43. 8 |
| Nonwhite..... | 1, 138 | 441 | 38. 8 |

From birth certificate data it was found that in 13 percent of the white births studied, the mother either had no serologic test for syphilis (STS) or had had an STS only during the last trimester of pregnancy, as compared with 44 percent among Puerto Rican and 39 percent among nonwhite pregnant women. If only 60 percent of nonwhite pregnant women are being adequately tested for syphilis in New York City, where a prenatal law has been in effect since 1938 and where medical facilities are known to be available, there is reason to believe

that administration of the prenatal law is even less effective in areas where prenatal care is less adequate. With higher percentages of nonwhites in an area, the administration of the law becomes less effective for this group.

Penicillin Therapy

Another factor which adds to the difficulty of evaluating prenatal blood testing is penicillin therapy. This has undoubtedly affected, even to the point of destroying trend comparability, the two measures we use to estimate the incidence of congenital syphilis, namely, reported number of cases and infant mortality due to syphilis. With penicillin readily available and carrying little therapeutic risk, many physicians have adopted the policy, in cases of doubtful diagnosis, of treating infants on a prophylactic basis. Since these cases are not diagnosed, they are not included in the congenital syphilis case rate. On the other hand, treatment of syphilitic babies with penicillin has been so successful that infant mortality due to syphilis is no longer comparable to this rate during the arsenical-bismuth era. Thus, the reductions in the incidence of congenital syphilis may be due, for the most part, to therapy rather than to the actual prevention of cases. Very recently, with the alarm aroused by increased reactions to penicillin, this therapy is in many cases being withheld, which complicates the trend pictures even more, but at the same time points up the need for prenatal screening.

Congenital Syphilis

Another facet of the evaluation of required blood-testing programs centers on the difficulty of diagnosing congenital syphilis. In infants, there may be no physical signs of the disease, and the serologic test is sometimes negative until 3 or 4 months of age. In present-day venereal disease control programs, many years pass before it is certain that all children at risk have been screened for congenital syphilis. Mass blood-testing programs are designed for those who have reached early adulthood, and we know from experience that very few cases of congenital syphilis are found in blood-testing surveys. Hence, the child with congenital syphilis often remains undiscovered and un-

treated until he enters school, applies for a job, enters military service, or plans to marry. An effective prenatal blood-testing law will protect him from infection before birth. For instance, in the fiscal year 1955, 4.8 percent of the reported cases of congenital syphilis were in infants less than 1 year old at time of discovery of syphilis, 2.2 percent in children aged 1-4 years, 8.1 percent in children aged 5-9, and 85 percent were in children 10 years old or older. In numbers, this means that 4,700 of the 5,515 patients with congenital syphilis reported in fiscal year 1955 were approaching or had reached adulthood before detection of the disease. This number, added to the undiscovered reservoir of cases still in the population, represents, in a measure, the past failures of prenatal blood testing and points up the need for more effective administration of the law.

Premarital Testing

Reactivity rates in premarital blood testing have not declined in the period 1951-54, the only period for which we have data available. This maintained level of reactivity indicates that whatever reasons there may have been for the original enactment of the laws, these reasons may still be valid. The argument may be raised that premarital blood testing has not discovered an appreciable number of cases of early syphilis; however, it must be kept in mind that premarital blood testing was not expected to find much lesion syphilis. Conservative estimates indicate that 12,000 to 13,000 previously untreated syphilitic persons are found annually through premarital blood testing. Because of the age-interval of candidates for premarital blood testing, most of the cases of syphilis detected are early latent. Our current epidemiological indexes indicate that each person diagnosed with early latent syphilis names, on the average, 2 contacts, and that 115 cases of syphilis per 1,000 of these contacts examined are found as a result of contact interviewing.

Required blood testing has general health educational value. The very fact that it is required by law is convincing proof to many of the efficacy of such a procedure. Very few people submit to premarital or prenatal blood

testing without some notion of why they are being tested. Premarital blood testing, which in most States is incorporated as part of a physical examination, offers the physician opportunities to find lesion syphilis, to do effective case finding of other diseases, and, in some cases, to provide sex education and marriage counseling. Premarital and prenatal blood testing in the control of syphilis are analogous to preventive medicine in other diseases. Since preventive medicine is the very essence of public health, blood-testing legislation is desirable.

As an index of prevalence of syphilis, the need for required blood testing continues. Perhaps of greater importance than as a statistical measure of control, required blood testing screens a segment of the population in which the incidence of early syphilis must be kept at a minimum if venereal disease control is to be maintained. Furthermore, the value of prenatal and premarital blood-testing laws must be measured against the number of cases of syphilis prevented by the existence of these laws as well as in terms of the cases found by their operation.

As a possible example of this dual evaluation of blood-testing laws, 100 cases of early syphilis detected among 100,000 persons examined premaritally would result in an infection rate of only 1 case per 1,000 examined. However, in terms of prevention, the 100 additional new infections which could have developed in prospective marital partners, plus the likely congenital infections in offspring of these marital unions, increase this rate to new proportions. By adding to these infections the previous contacts from which the initial 100 infections were acquired, 1 case actually detected among each 1,000 premarital examinees should be increased to perhaps 5 cases (assuming 2 offspring to each union) to measure more accurately the efficiency of premarital epidemiology and case finding.

Summary

Premarital and prenatal blood-testing legislation, when properly administered, contributes to venereal disease control by (a) detecting and bringing or returning to treatment persons with syphilis, (b) preventing the transmission of syphilis to marital partners, (c) protecting un-

born children from congenital infection, (d) reducing morbidity and mortality due to syphilis and to other causes among infants by encouraging prenatal care, and (e) providing opportunities for general health education, sex education, and marriage counseling. Despite the accomplishments of required blood-testing

programs during recent years, there remains much to be done toward the prevention and control of congenital syphilis. As long as cases of congenital syphilitic infection continue to be found in our population, there is a definite need for strict enforcement of blood-testing legislation.

Revised Statement of Rheumatic Fever Prevention

Revised recommendations for preventing first and repeat attacks of rheumatic fever are incorporated in a new edition of the American Heart Association's statement on Prevention of Rheumatic Fever and Bacterial Endocarditis Through Control of Streptococcal Infections.

This is the second revision of the statement, prepared by the AHA Committee on Prevention of Rheumatic Fever and Bacterial Endocarditis to keep pace with the progressively growing body of knowledge and experience in this field. The committee points out that no recommendations can be considered final at this time. Revisions and changes will be made as new knowledge may indicate.

Principal Changes

Following are the principal changes in the recommendations:

1. Greater emphasis is placed on the value of throat cultures in diagnosing streptococcal infections with a view to stimulating an increased use of cultures, particularly when clinical manifestations alone are inconclusive.

2. The recommended duration of prophylaxis has been qualified. The committee reaffirms its view that continuous prophylaxis should be maintained indefinitely for known rheumatic subjects, but it recognizes that some physicians may wish to make exceptions in certain of their adult patients, particularly those without heart disease who have had no rheumatic attacks for many years.

3. Monthly injection of 1,200,000 units of benzathine penicillin G intramuscularly is now listed first among prophylactic methods. The committee also indicates that it is preferable, if oral penicillin is chosen as the method of prophylaxis, to prescribe 200,000-250,000 units twice daily, rather than once,

providing an additional safeguard against breakthroughs which have been reported with the smaller dosage.

Bacterial Endocarditis Prophylaxis

Also revised in the statement are the recommended dosages for prophylaxis against bacterial endocarditis in patients with rheumatic or congenital heart disease who are obliged to undergo such surgical procedures as dental extractions and tonsillectomies. Emphasizing that the dosage regimens used for long-term prophylaxis of streptococcal infections are inadequate for this purpose, the committee recommends that high blood levels of penicillin be maintained for several days (rather than, as previously stated, on the day of operation alone) to prevent organisms from lodging in the heart valves during the period of transient bacteremia.

In general, the combined oral and parenteral route of administration is preferred, as follows: oral penicillin (200,000-250,000 units four times a day) for the 2 days before and the 2 days after surgery; the same dosage of oral penicillin on the day of surgery plus 600,000 units of aqueous penicillin with 600,000 units of procaine penicillin shortly before operation. Alternative recommendations are included for situations in which injection is not feasible or penicillin is contraindicated.

The revised statement appears in the December 1956 issue of *Modern Concepts of Cardiovascular Disease* and in the January 1957 issue of *Circulation*. An outline of a recommended method for culturing beta hemolytic streptococci from the throat is also being made available by the association and may be obtained from local heart associations or the American Heart Association, 44 East 23d Street, New York 10, N. Y.

Serology Control Program Of the Venereal Disease Research Laboratory

By AD HARRIS
and HILFRED N. BOSSAK, B.S.

THE SEROLOGY CONTROL program of the Venereal Disease Research Laboratory was evolved to assist State laboratories in attaining and maintaining a high level of efficiency in serologic testing. Through these State laboratories, the testing efficiency of all laboratories of this country performing serologic tests for syphilis may be favorably affected. This program has nine integrated segments, each of which is of little value as a separate entity, but which, collectively, have been effective in reaching the objective with a minimal expenditure of time and money. The serology control program has also served as a pattern of operation used by several States as a service to the laboratories within their jurisdictions. Available to the central laboratories of the 48 States, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands, the services of the program include:

Providing a laboratory manual prepared by the staff of the Venereal Disease Research Laboratory.

Providing reference-standard serologic reagents prepared by the staff of the Venereal Disease Research Laboratory.

Inspecting laboratory serology control programs.

Conducting scheduled training courses.

Conducting field refresher training courses or workshops.

Standardizing and supplying dehydrated control serum.

Conducting hemispherewide serologic evaluation studies on a continuing basis.

Mr. Harris is director of and Mr. Bossak is a bacteriologist with the Venereal Disease Research Laboratory, Public Health Service, Chamblee, Ga. Their paper was presented at the First International Symposium on Venereal Diseases and the Treponematoses, Washington, D.C., May 28-June 1, 1956.

Participating as a control or co-control in intrastate serologic evaluation studies.

Offering a *Treponema pallidum* immobilization (TPI) testing service, nationwide, through the State and Territorial laboratories.

Manual of Serologic Tests

A Manual of Serologic Tests for Syphilis has been prepared with the assistance of the authors of the tests and is revised at appropriate intervals. The manual contains general information about equipment; cleaning and care of glassware, antigens, and other reagents used in serologic tests; the effect of room temperature on test results; reporting of serologic test results; and laboratory control of test performances. Technique outlines, including recommendations for equipment, glassware, reagents, and step-by-step procedure for APHA reference, Hinton, Kahn, Kline, Kolmer, Mazzini, Rein-Bossak, and VDRL tests, are contained in the 1955 edition (1). Instructions are given in the appendix for the collection and preservation of sheep red cells, preparation and preservation of complement, use of merthiolate as a bacteriostat for spinal fluid, and a recommended method for quantitative determination of spinal fluid protein. This manual has been revised at approximately 5-year intervals in order to stay abreast of acceptable changes in the field of serology. The 1955 edition is the latest revision.

Services to Laboratories

Standardized antigens and other reagents for the tests listed in the Manual of Serologic Tests for Syphilis are prepared and made available for check-testing purposes to commercial or State laboratories that manufacture or purchase these reagents. During past years, the older type, lipoidal antigens were standardized and distributed for use in check-testing but this activity is now confined to the cardiolipin-type antigens. Verification testing of antigens prepared by State laboratories is also done on request. Agreements have been reached under which samples of VDRL antigen are submitted to the Venereal Disease Research Laboratory for check-testing and approval before sale by commercial laboratories in this country.

State laboratories are visited on request for consultation and for reviewing their serology program (testing, laboratory control, training, and laboratory visitation). Written reports of observations, commendations, and recommended changes, if any, are submitted to the State laboratory director and the State health officer. This service will be more fully described in a later paper.

Training Courses

Training courses are regularly scheduled at the Venereal Disease Research Laboratory. Nine 2-week courses were scheduled during the fiscal year 1956; 10 courses were held. Applications from this country for these 2-week courses must be signed by the State health officer or the State laboratory director, unless the applicant is an employee of the Public Health Service, in which case the application must be approved by the medical officer in charge of the laboratory where the applicant is employed. Trainees are accepted from Armed Forces installations in this country and from the World Health Organization, the Pan-American Sanitary Bureau, and employees of central laboratories in other countries. Schedules of courses for each fiscal year are distributed before July 1, and reservations are made as soon as applications are received. Application lists are closed 1 month before the dates the courses are to start.

Five courses titled "Serology of Syphilis" were scheduled for the fiscal year beginning July 1956. These courses provide refresher training to senior operating personnel of State and Public Health Service laboratories. They are composed of lecture, demonstration, and participation periods covering the most widely used American methods for the serodiagnosis of syphilis, with references to latest developments in this field.

The two courses in management and control of syphilis serology by the regional laboratory are designed for assistant laboratory directors and senior laboratory staff members and include review of interlaboratory serologic evaluation studies, laboratory inspection procedures, demonstration of antigen check-testing and standardization, and preparation of control serum.

Courses about tests for syphilis using the *Treponema pallidum* include lectures, demonstration of and class participation in the immobilization (TPI), agglutination (TPA), complement-fixation (TPCF), immune-adherence (TPIA), and other tests which use the virulent *Treponema pallidum* as an antigen source. The complexity of these tests requires that these classes be limited to small groups, so it has been necessary to schedule additional classes when large numbers of qualified applicants have applied. Applicants for these courses should have had adequate experience in the field of serology and be in supervisory positions.

Field refresher training courses are also held in cooperation with State department of health laboratories. On-the-job training is also accomplished during visits to Public Health Service laboratory facilities.

Control Serum

Dehydrated control serum for serologic tests for syphilis is offered to the State laboratories and to Public Health Service laboratories on a continuing basis. Twenty-six ampules of serum, considered to be a 6 months' supply when used at the rate of one ampule per week, are sent with a protocol showing the reactivity of each lot of serum in all of the tests performed at the Venereal Disease Research Laboratory. Continuous use of this control serum will allow the laboratories to determine the relative reactivity of their tests as compared with the same tests performed at the Venereal Disease Research Laboratory and, secondly, will show whether the reactivity of their tests is remaining at a constant level or is varying from day to day. The laboratories that use this serum do not report their findings to the Venereal Disease Research Laboratory, since this is not considered to be an evaluation service.

Serologic Evaluation Studies

The Public Health Service Serologic Evaluation Study is presently being conducted by distributing 20 samples of prepared sterile serum to each of 62 participating laboratories in each of 10 months of the fiscal year. During

the remaining 2 months, all reports are tabulated and an analysis of comparative results is issued. Laboratories participating in this study during the fiscal year 1956 included the central laboratories of the 48 States, the District of Columbia, Alaska, Puerto Rico, Hawaii, Mexico, and Canada, plus the Kahn, Kline, Kohner, Hinton, Rein, and Mazzini laboratories and the Venereal Disease Research Laboratory. This type of serologic evaluation study produces data that may be used to ascertain relative efficiency of many laboratory performances of each type or kind of test as compared with the test-author results. In order to make available to the participating laboratories some comparative results before the yearly report is analyzed, a report of the results obtained at the Venereal Disease Research Laboratory each month, with all procedures, is sent to all participating laboratories as soon as their monthly report is received.

A similar, but smaller, serologic evaluation study is presently being conducted for the laboratories of Public Health Service facilities. In this study, 10 samples of prepared serum will be sent monthly for 5 months of this fiscal year to each of 26 Public Health Service laboratories. A report of the results obtained with the VDRL slide test and the Kohner test at the Venereal Disease Research Laboratory is returned to the laboratories participating in this study as soon as their monthly reports are received.

Use of VDRL Services

The central laboratories of all 48 States, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands have received one or more of the services referred to in this report during the recent past. In the calendar year

1955, these laboratories utilized the services and control functions of the Venereal Disease Research Laboratory 264 times, in addition to submitting 2,875 serums for TPI testing. Additional services were given to the central laboratories of other countries either directly or through the function of the Venereal Disease Research Laboratory as a reference laboratory for the World Health Organization.

TPI Testing Service

The *Treponema pallidum* immobilization (TPI) test has been offered since January 1955 as an additional reference service, on a nationwide basis, through the laboratories of State health departments, by the Venereal Disease Research Laboratory. Criteria for acceptance of specimens for this testing are stipulated. Blood specimens are sent to State laboratories, where sterile serum is separated and forwarded to the Venereal Disease Research Laboratory. Each specimen of serum must be accompanied by a completed clinical data sheet containing statements about evidence or history of treponematosi; syphilis in the family; other venereal diseases; record of known STS; diseases other than treponematosi especially those presumed to elicit nonspecific reactions in STS; and the opinion of the attending physician regarding present diagnosis. Reports of TPI tests are sent to the respective State laboratories for forwarding to the submitting physician. During the first months of 1956, requests for this service were received at the rate of approximately 100 per week.

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Occupational Health on Farms

By HENRY N. DOYLE

HEALTH AGENCIES have many as yet undischarged responsibilities toward rural Americans. To comprehend the responsibilities of official agencies for occupational health on farms, it is useful to grasp the extent of industrialization of American agriculture.

The population of the United States in 1910 was 92 million. Today, it is 166 million, an increase of 80 percent. In 1910 there were 322 million acres of cropland. Today there are 350 million acres of cropland, an increase of only 9 percent. Yet, this acreage produces more than enough food for our expanded population. It is estimated that 310 million acres will supply our 1960 population, thanks to the increase in productivity per acre. Improved soil management, such as erosion control and the use of fertilizers and other agricultural chemicals, including pesticides and weedkillers, have contributed part of this gain. Power machinery has increased the farmer's capacity to plow, sow, harvest, and manage livestock. Furthermore, market crops now grow on about 75 million acres formerly used to grow feed for the horses and mules which have been replaced by power machines.

Mechanization has made it possible for farms to produce more than enough for our present needs through the efforts of only 6,500,000 farm workers, or 11 percent of our working popu-

lation, whereas in 1910, 11,600,000, or 31 percent, were employed in agriculture.

The number of American farms in 1954 was 5,425,000, as compared with about 6,600,000 in 1910. More important, half of our present farms produce nine-tenths of the crops. This concentration offers a striking parallel to many industries in which a small number of large companies account for a high percentage of the total production.

Even as large manufacturing concerns tend, with large-scale operations, to employ the latest advances in mechanization, so, and frequently to a greater degree, large farms tend to employ mechanical equipment. The capital investment associated with many of the new mechanical farm devices often runs to a sum which is not economical for a single-family farm.

Some idea of how mechanization has progressed in farming may be obtained from United States Department of Agriculture statistics which reveal that between 1941 and 1952 the number of tractors increased from 1.7 million to 4.4 million (159 percent), the number of grain combines from 225,000 to 940,000 (318 percent), and the number of mechanical corn-pickers from 120,000 to 635,000 (429 percent). The increase of total power on American farms during that period exceeded 70 percent. Farm output per man now has approximately doubled in the 15 years since Pearl Harbor.

Agricultural changes during the past generation, therefore, have come to create new working conditions even as industrialization changed working conditions in mines and mills.

How do these new conditions affect the health and safety of farm workers? Farming is intrinsically hazardous. Injuries have always been frequent on farms. Although statistical

Mr. Doyle is assistant chief of the Occupational Health Program, Public Health Service. His paper and the summaries of the papers on silicosis and X-ray exposure (p. 149) are based on talks delivered to the American Conference of Governmental Industrial Hygienists, Philadelphia, April 21-24, 1956.

evidence is lacking, experience has led us to expect many injuries from the handling of farm horses. A limited survey in one county within the past 6 months showed that 8 out of 29 recent accidents were associated with horses. Even with mechanization, farmers tend to keep a few horses. Of 44 farms visited in this survey, 36 had at least one horse. The total was 182.

Other farm animals also, particularly bulls, present hazards to farm hands. Injuries from the use of sharp or heavy tools or the stress of heavy lifting also are common farm afflictions, frequently resulting in chronic conditions, herniation, paraplegia, or impairment of vision.

The danger of infections from injuries incurred on the farm must be considered much greater than that in industry. This danger is heightened by the nature of the working environment, the inaccessibility of first-aid facilities, and the absence of interest in giving prompt care to minor wounds and other dermatological conditions. The prevalence of the tetanus hazard on farms is well recognized by physicians, but other organisms also must be considered.

A number of bacterial diseases are associated with agricultural work. Brucellosis, or undulant fever, is thought to be the most common one, but reliable statistics are lacking. It is not likely that all brucellosis is correctly diagnosed or that all diagnosed cases are reported. One factor contributing to the incidence of brucellosis is that rather than call upon a veterinarian, many farmers themselves vaccinate cattle and thereby risk accidental infection. Other diseases of significance on farms include anthrax, erysipeloid, leptospirosis, tularemia, bovine tuberculosis, and various forms of salmonellosis.

By occupation, the farmer is exposed also to viral and rickettsial diseases, including equine encephalomyelitis, psittacosis, Q fever, and Rocky Mountain spotted fever. There is a long list of mycotic diseases, of which actinomycosis and histoplasmosis are examples. A number of parasitic diseases also are potential farm hazards.

Moving from these biological hazards to physical agents, we find that farm work involves exposure to extremes of temperature,

both high and low. Heat exhaustion and heat stroke undoubtedly affect many farm workers. Another condition of possible significance is skin cancer, produced by prolonged exposure to the sun's rays.

The increased use of machines has brought a whole group of hazards new to agriculture. Noise exposures, for example, may now be sufficient to affect the hearing of farmhands who operate machines for extended periods. When more is learned about the problem of vibration, it may also be found to have adverse health effects on agricultural workers. Maintenance and repair work on farm machinery introduce hazards associated with welding.

Accidents incurred in the use of farm machinery represent one of the major categories of farm hazards. Accident rates in agriculture are far above industry as a whole. In 1954 only the mining and construction industries had higher death rates: Agriculture had 60 fatal work accidents per 100,000 (a total of 3,800) as compared with a rate of 25 per 100,000 for all industries. The injury rate, according to the National Safety Council, was 4,930 per 100,000 as compared with 3,240 per 100,000 for all industries.

Hazard From Chemicals

In addition to biological and physical hazards, the industrial hygienist who looks at present-day farming is struck forcibly by the number of toxic chemicals in use. Although many of these are soil conditioners and fertilizers involving little hazard, the majority are insecticides, fungicides, rodenticides, nematocides, and weedkillers which are employed specifically because of their toxic properties. While some are comparatively safe, nearly all present some degree of danger, and some must be classified as extremely hazardous. In particular, the heavy metals, such as lead, arsenic, and mercury, the halogenated hydrocarbons, and the organic phosphates present serious potential dangers to the people using them and sometimes to others working or living in the vicinity.

In dealing with industrial exposure to hazardous materials, we frequently express the view that any material, regardless of toxicity, can be used safely provided that proper

control measures are employed. The same philosophy might be applied to agriculture, but assurance of proper control measures is harder to obtain, at least at the present time. The reasons are apparent. Industrial operations are usually performed in a fixed location where exhaust ventilation or other suitable control methods are feasible. Industry has been subjected to fairly extensive and intensive educational programs on health and safety for at least a generation. Large companies usually have full-time safety and medical departments alert to potential dangers. Furthermore, personnel of insurance carriers and official agencies make frequent visits to industrial plants to check for possible hazards.

On the other hand, agricultural workers generally have little idea of the hazards of handling and applying powerful chemicals. Although most chemicals of this type carry warnings on the container labels, the tendency is to pay little or no attention to the labels, particularly if a material has been used previously without untoward incident.

Moreover, the methods of application are almost as varied as the materials used. Many of these methods present dangers that would not be tolerated in manufacturing establishments. For example, the application of fumigants such as carbon tetrachloride in connection with grain storage may employ techniques that would horrify an industrial hygienist. A recent farm survey observed workers tying handkerchiefs over their faces to protect themselves from heavy concentrations of carbon tetrachloride.

The hazards of farm life are not to be ignored. And they are not ignored although much remains to be done to protect the farmer's health.

Health Services for Farm Workers

Occupational health programs are conducted in official agencies either because of laws specifically concerning industrial working conditions or because of broad powers regarding the protection of health. Virtually all such programs were introduced to cope primarily with problems associated with manufacturing, and, sometimes, also mining. Few

of them gave much thought initially to the farm worker. In recent years, certain State officials have devoted attention to specific farm problems brought to their attention. For example, in Florida, in 1952 there were 46 claims for parathion poisoning filed; in 1953, there were 45. The Florida State division of industrial hygiene has since conducted an educational campaign among citrus grove and truck garden owners on the hazards of insecticides and preventive measures.

Also, California has conducted investigations of the high incidence of occupational disease among its agricultural workers. In 1954, of 23,101 reports of occupational disease in California, 3,143 (13.6 percent) were for agricultural workers.

In addition to purely occupational influences, the health of many farm workers is affected by environmental factors that are much less significant among present-day urban workers. Farm laborers, especially migrant workers, sometimes must live where housing and sanitation levels are far below those now considered as acceptable or safe. Large numbers of workers move from one State to another in pursuit of peak season farm work, and they stop at places where waste disposal is primitive, where water supplies are of questionable quality, where food spoilage is difficult to prevent, and where protection against flies and other disease carriers is absent. With this mobile population, numbering more than the citizens of several States, public health considerations demand far more than control of the traditional occupational diseases. In addition to basic sanitation, there must be answers to knotty questions of medical care for individuals not eligible for service available to permanent residents. Otherwise, it is reasonable to expect that transient workers will be permitted to carry communicable disease to every community that summons their services.

While rural health services can use all available community resources, occupational health personnel must not overlook their special responsibility. Industrial hygienists, in checking the working environment in factories and mines, are also concerned with the water supply, washing facilities, waste disposal, and food sanitation. Nor should they neglect these

points with respect to farm work, or, for that matter, in other situations where rural workers are housed temporarily, as in construction camps. Since such responsibilities also rest upon other personnel in State and local health agencies, policies for the best utilization of available man-hours must be developed to meet the individual situation. It is important, however, to recognize the place of environmental and medical care services in the occupational conditions of agricultural workers.

South Dakota and Iowa Programs

As stated before, a number of State occupational health officials have concerned themselves, to a limited extent, with specific or selected health needs of agricultural workers. To the best of our knowledge, however, no agency has ever considered the total need, with the objective of ascertaining the extent and severity of health problems on the farms of its State. This approach, which has been applied effectively by the States in planning logical and sustained programs for the improvement of worker health in industry, must now be used in agriculture if we are successfully to protect and improve the health of the farm family and its helpers.

The first stirring of activity in this direction came in 1955, when the South Dakota Department of Public Health requested assistance in planning an occupational health program for the State. In response to this request, the Public Health Service suggested that the program be developed to give industry and agriculture equal consideration from the start. To help develop such a program, the Occupational Health Program of the Public Health Service assigned a veterinarian to South Dakota in September 1955. Through this project it is hoped to evaluate the effectiveness of certain

survey techniques and to develop useful information regarding occupational health problems and methods for their attack.

Coincidentally, during 1955 the State University of Iowa Medical School established an Institute of Agricultural Health which will study similar questions in Iowa.

It is significant, we believe, that these related projects were independently conceived and started at this time. Although the existence of health and safety hazards on the farm has been recognized by public health authorities for some years, the South Dakota and Iowa programs represent the first positive steps taken toward a comprehensive approach to the problem.

While some findings from these two States may become available relatively soon, other States need not wait for them before taking stock of the adequacy of their activities with respect to this particular segment of the employed population. Indeed, because of variations in crops, climate, soil, and other factors, problems will be found to differ in each locality, and all States can contribute appreciably to scientific knowledge while carrying out a public health activity of real merit.

The subjects which need exploration are numerous. Study needs to be made of the toxicology and proper application of chemicals, of the safe use of mechanized equipment, of the general health status of agricultural workers as compared with the rest of the population, of the effectiveness of educational measures, and of the availability of health resources.

This is a new and complex field confronting the industrial hygienist. Occupational health needs on the farm may not be readily anticipated, but in every State where agriculture is a significant industry, an earnest beginning should be made to meet this public health responsibility.

Pediatricians Receive Low X-ray Doses

PHR X-rays as an occupational hazard of physicians have been associated with a relatively high incidence of leukemia in the medical profession.

In an effort to measure the probable routine exposure to radiation of certain specialists in private practice (in contrast to the number of such studies that have been pursued in hospitals), representatives of the Public Health Service arranged to survey the offices of 55 pediatricians in Hamilton County, Ohio.

All but 10 of the physicians used X-ray equipment, mainly for fluoroscopy. The survey was confined to this use. Instruments measured the time the fluoroscopes were in operation for 2 weeks; pocket chambers and film badges determined the exposure of the physicians in the period studied; the team inspected the condition and operation of the equipment; and the medical officer examined the physicians for evidence of gross radiation injury.

The condition of the equipment presented shock hazards, apart from the danger of radiations. Nearly half of the machines were not grounded. Several, thought to be grounded, were not. Also, certain high voltage conductors were exposed.

Scatter or stray radiation at points where the fluoroscopist would be exposed exceeded 50 milliroentgens per minute in 14 instances. Patient's exposure to 6 of the machines exceeded 20 roentgens per minute. Another 16 were above 10 roentgens per minute. The recommended limit is 10 roentgens per minute. For infants and children, it should be much less than that.

The physicians with highest exposures were able to identify and correct errors in procedure.

By Peter J. Valaer, B.S., electronics scientist, and Mitchell R. Zavon, M.D., formerly surgeon, Occupational Health Field Headquarters, Public Health Service, Cincinnati. Dr. Zavon is now with Kettering Laboratory, Cincinnati. The full paper is to be published in the American Industrial Hygiene Association Quarterly for March 1957.

Three had worn no lead garments. One used a beam of high intensity. Another held the patient, a child, and received high dosage to his arms.

The saving factor in the situation was that more than half of the fluoroscopes were used less than 1½ minutes a week. Consequently, most exposures of physicians were well below present recommended limits.

Silicosis Prevalence Persists in Industry

PHR Silicosis persists in the United States both as an occupational hazard and as a cause of chronic if not disabling illness among many who were exposed before industrial safeguards had been established. This finding is based on a study of official records from scattered sources, described in some detail at the conference and in other publications.

The study, undertaken by the Division of Special Health Services, Bureau of State Services, Public Health Service, aimed to develop answers to four questions:

1. What is the prevalence of silicosis in the United States?
2. What are the characteristics of the silicotic population?
3. Are a significant number of new cases developing among workers entering dusty trades for the first time in the past 20 years?
4. What aspects of dust exposure need further study?

The findings of the study are to be presented in a special bulletin.

Preliminary observations indicate that the prevalence of silicosis may be several times the number of cases, more than 10,000 that were compensated or reported in one form or another in 22 States in 1950 to 1954, inclusive.

By Victoria M. Trasko, program adviser, Occupational Health Field Headquarters, Public Health Service, Cincinnati.

Geographic variations in prevalence were affected not only by industrial patterns but also by legal variations. In States where partial disability is compensable, it was to be expected that a relatively greater number of cases would be reported.

A strong indication that the number reported is below the real prevalence figure is found in the fact that in the 5-year period probably 10,000 died from occupational lung disease, but of the more than 10,000 cases reported for this study only 4 of 5 persons are known to have died.

The silicotic patients studied were in the main elderly. Of 4,814 analyzed in all stages of the disease, only 120 were under 35, 1,025 were age 35 to 49, 2,437 were 50 to 64, and 1,232 over 65. In effect, three-fourths were more than 50 years old. But in certain States, depending on the source of information, a much higher proportion of the men were relatively young. This was true especially in eastern States.

These findings provide a partial answer to the third question. Although many cases are the consequence of exposure in days when protective measures were lacking, there are enough young men who must have been exposed in recent years.

The mobility of the working force, with frequent job changes, hinders efforts of the epidem-

ologist to determine which industries are most productive of silicosis, but the highest proportion of cases appear to have been associated with mining, especially coal mining and secondarily metal mining. Of the forms of manufacture associated with silicosis, foundries appear to have been as productive of silicosis as metal mining. This analysis only suggests the most productive sources of the disease, not the relative dangers in the industries concerned.

To judge by the numbers of young men affected, no industry can be certain that it is protecting completely its employees from exposure to dust. Sufficient evidence was uncovered to suggest that either the application of dust control measures is not universal or other factors are involved. The studies suggest that, with relatively light and brief exposures to dust, the disease may take longer to develop than in the past, a possibility that cannot be determined for some years to come.

Such questions warrant further study, especially in view of the rising trend of applications for compensation or public assistance for silicotics. Future studies will be facilitated if diagnosis and reporting improve, if diagnoses and terminology are consistent, and if standards are applied to criteria of disability and to supervised employment of nondisabled silicotics.

Venereal Disease Course

The 26th Venereal Disease Postgraduate Conference for Physicians, sponsored by the University of Tennessee College of Medicine and the Public Health Service, will be held at the College of Medicine in Memphis, April 18-20, 1957.

The course is designed to acquaint the practitioner with the latest developments in diagnosis, treatment, and management of the venereal diseases. Discussion leaders for the course will be drawn from university faculties, Public Health Service personnel, and other outstanding authorities in the field.

No tuition will be charged. Applications for admission are to be sent to Dr. Henry Packer, Department of Preventive Medicine, University of Tennessee College of Medicine, Memphis 3, Tenn.

Analyzing the Tuberculosis Case Register

By HERMAN E. WIRTH, M.D., M.P.A., and BEN Z. LOCKE, M.S.

THE FIRST statewide analysis of local tuberculosis case registers in New York State, excluding New York City, was undertaken in 1952. This analysis was based on certain data contained in the registers maintained by 38 city, county, and State health district jurisdictions. The objectives were to determine the number of cases requiring supervision; to study the characteristics of known cases with respect to age, sex, residence, stage of disease, clinical status, sputum status, and type of supervision; and to evaluate the effectiveness of control activities.

The methods used and results obtained were distributed to all full-time health officers concerned and were published in detail (1). Subsequently, regional conferences were held for three major areas, Buffalo, Rochester, and Albany, for the purpose of reviewing the reported findings and of exploring methods for solving the questions raised by the analysis. These regional conferences, consisting mainly of informal roundtable discussions, were attended by regional and local health administrators, tuberculosis hospital directors, supervising public health nurses, program directors, and staff statisticians as well as representatives of local voluntary tuberculosis associations.

In 1955 a second statewide analysis was conducted from February through June to obtain similar data and to determine what changes

had occurred. The second analysis was also desirable to ascertain the indirect effects of the widespread use of antimicrobial drugs, the emergence of treatment plans on a nonhospitalized basis, and the emphasis on resectional surgery. In addition, there was the need to know what administrative steps had been taken locally to provide more and better service, streamline procedures, remove "deadwood" from the registers, and encourage possible savings. Thus, a fourth objective in the 1955 analysis was a review of the epidemiological and administrative changes in the interim period. Certain items of the 1952 analysis were discarded and other more significant ones included. At the time of the second analysis, 40 local agencies were maintaining case registers.

Administrative Aspects

The value of the case register to administrators depends on the up-to-dateness of entries relating to the persons registered. For the health officer, the register must present the significant facets of the tuberculosis problem in the community if he is to initiate in proper degree those activities needed to resolve the problem. Such activities as case and contact finding, nursing supervision, laboratory and X-ray examination, clinical consultation, treatment, hospitalization, and disposition can only be effectively conducted with the aid of timely data periodically obtained and promptly recorded in adequate detail. This need has been stressed often (2-5).

Of 23,112 cases contained in registers, 4,807 were excluded from the 1955 study because their retention in the visible case registers was not

Dr. Wirth, who has been with the New York State Department of Health since 1948, is associate director of the division of tuberculosis control. Mr. Locke, now chief of the Consultation Unit, Current Reports Section of the National Institute of Mental Health, Public Health Service, was with the New York State Department of Health from 1947 to 1956.

Geographic variations in prevalence were affected not only by industrial patterns but also by legal variations. In States where partial disability is compensable, it was to be expected that a relatively greater number of cases would be reported.

A strong indication that the number reported is below the real prevalence figure is found in the fact that in the 5-year period probably 10,000 died from occupational lung disease, but of the more than 10,000 cases reported for this study only 4 of 5 persons are known to have died.

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No tuition will be charged. Applications for admission are to be sent to Dr. Henry Packer, Department of Preventive Medicine, University of Tennessee College of Medicine, Memphis 3, Tenn.

Table 3. Comparison of 1952 and 1955 percentage distributions of pulmonary tuberculosis cases, by stage of disease, New York State exclusive of New York City

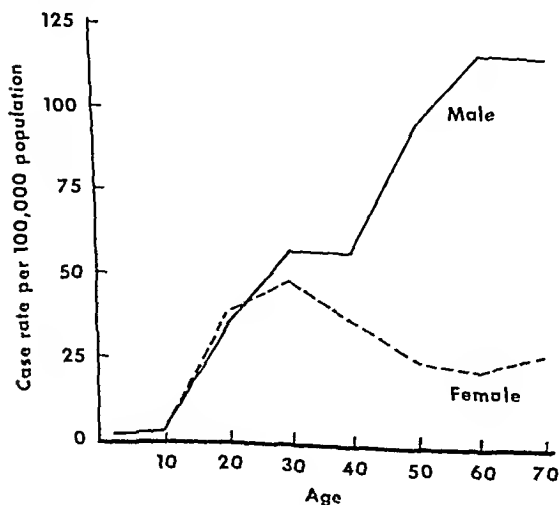
| Stage of disease | 1952 | | 1955 | |
|-----------------------|---------|----------|---------|----------|
| | Number | Per-cent | Number | Per-cent |
| All stages----- | 18, 118 | 100. 0 | 16, 692 | 100. 0 |
| Minimal----- | 4, 715 | 26. 0 | 4, 068 | 24. 4 |
| Moderately advanced-- | 7, 623 | 42. 1 | 7, 190 | 43. 1 |
| Far advanced----- | 5, 059 | 27. 9 | 5, 053 | 30. 3 |
| Not stated----- | 721 | 4. 0 | 381 | 2. 3 |

by all concerned with public health" (1). The only change needed to make this statement applicable to the 1955 analysis is to note that the number of cases is now only 500 less.

The 1955 analysis reemphasized that the tuberculosis problem is greatest among men, particularly those in the older age group. Males constituted 58 percent of the registered pulmonary cases in 1952 (9) and 62 percent in 1955. The number of males registered as tuberculous remained nearly the same. The rate per 1,000 population was 2.9 for males as compared with 1.8 for females.

The 1955 prevalence rate for women reached a peak at 30 years of age, at which point it was

Figure 1. Rates for newly reported pulmonary tuberculosis cases, 1954, New York State exclusive of New York City.



only slightly higher than the rate for men. The male rate rose to a peak at 60 years. These findings are similar to those of 1952 (9). The configuration of the 1955 prevalence rates was also similar to that of the newly reported pulmonary tuberculosis case rates for 1954 (fig. 1). Of 16,692 persons with pulmonary tuberculosis, only 126 were under 15 years of age.

The 1955 review of the registers also showed that far advanced cases accounted for 34 percent of the pulmonary tuberculosis among males as compared with 25 percent for females.

The men with tuberculosis are about 10 years older than the women, and persons with minimal extent are younger than those with advanced disease (table 4).

These findings substantiate data from other sources and point up the need for continued

Table 4. Median age of pulmonary tuberculosis cases, by sex and stage of disease, 1952 and 1955, New York State exclusive of New York City

| Stage of disease | Median age in years | | | |
|-----------------------|---------------------|-------|--------|-------|
| | Male | | Female | |
| | 1952 | 1955 | 1952 | 1955 |
| All stages----- | 48. 4 | 50. 0 | 38. 2 | 39. 0 |
| Minimal----- | 45. 8 | 45. 7 | 36. 1 | 35. 6 |
| Moderately advanced-- | 49. 0 | 50. 4 | 39. 0 | 40. 1 |
| Far advanced----- | 49. 9 | 51. 4 | 38. 8 | 40. 2 |

and increased case-finding activities among men aged 45 or over.

Sputum Status

Of the 16,692 pulmonary cases on the local tuberculosis case registers in 1955, 3,166, or 19 percent, had a positive sputum in the previous 12-month period. During this same period, however, no sputum information was reported for 8,245 cases, or 50 percent (fig. 2). The percentage of cases with no sputum examinations was only slightly less than in 1952. Sputum examinations represent one of the most important items in case and contact supervision. Since facilities are available, greater

Table 1. Tuberculosis cases excluded from 1952 and 1955 analyses, New York State exclusive of New York City

| Status | 1952 | 1955 |
|--|-------|-------|
| Total..... | 4,959 | 4,807 |
| Inactive, 18 months or more..... | 3,003 | 2,927 |
| Minimal, arrested 2 years or more..... | 1,141 | 737 |
| Healed primary..... | 291 | 478 |
| Healed nonpulmonary..... | 21 | 137 |
| Suspect..... | 102 | 328 |
| Dead..... | 401 | 200 |

in accordance with the suggested criteria of the New York State Health Department (6-8). Nearly 5,000 such cases had also been excluded from the 1952 analysis (table 1). Thus, there was no significant change despite the fact that removal of the cases would have aided materially in the management of the registers.

Although the health department's criteria for removing cases from the visible registers are not mandatory, their use provides a systematic and standardized approach to related clinical and clerical management problems.

The visible case register, or active file, contains the tuberculosis case and contact register cards on all cases classified as active, arrested, and inactive for less than 18 months among residents of an area administered by a full-time local health officer. The clinical status considered here refers to the 1950 classification of pulmonary tuberculosis of the National Tuberculosis Association.

After excluding these 4,807 cases, 18,305 known tuberculosis patients were recorded as requiring active medical and nursing supervision compared with 19,923 patients in 1952. Thus, the rate per 1,000 population of 2.4 in 1955 as compared with the 2.8 in 1952 represents a decrease of only 14 percent. The rate per 1,000 population in 1955 ranged from a low of 0.8 in Allegany County to a high of 6.2 in Franklin County. In 1952 the rate varied from 0.9 for Schuyler County to 9.9 for Franklin.

In contrast, between 1951 and 1954, the years that best compare with the years in which the data on the case registers were collected, the death rate fell 53 percent and the newly reported case rate fell 26 percent. It is thus apparent that, as the emphasis on new cases is

shifted to all known cases requiring active care, the need for medical facilities, care, and supervision still definitely exists.

Prevalence

The prevalence of known tuberculosis throughout New York State, except New York City, is determined from the visible registers (active files) of the local health offices. Actually, many persons with known disease do not constitute public health hazards and consequently should be withdrawn from the active registers although they may be under the care of a clinic or private physician. Conversely, there are as yet thousands of undetected cases subject to case-finding activities.

Nevertheless, the visible registers in the local health offices provide a count of the tuberculosis cases classified as known cases significant for public health supervision.

No consequential change occurred in the percentage distribution of the various types of tuberculosis in the 3 years that had elapsed since the first analysis (table 2). Each category showed a small decrease in number, the aggregate being 1,618. As previously noted, the known prevalence rate per 1,000 population decreased from 2.8 to 2.4.

There were some minor changes in the percentage distribution by stage of disease of pulmonary cases (table 3).

When the 1952 analysis was presented it was stated, "it is apparent that, with approximately 13,000 known pulmonary cases in the moderately and far advanced stages, tuberculosis in upstate New York requires continued efforts

Table 2. Number and percent of tuberculosis cases in visible registers by type, 1952 and 1955, New York State exclusive of New York City

| Tuberculosis type | 1952 | | 1955 | |
|------------------------|---------|----------|---------|----------|
| | Num-ber | Per-cent | Num-ber | Per-cent |
| All types..... | 19,923 | 100.0 | 18,305 | 100.0 |
| Pulmonary..... | 18,118 | 90.9 | 16,692 | 91.2 |
| Other respiratory..... | 938 | 4.7 | 843 | 4.6 |
| Other forms..... | 867 | 4.4 | 770 | 4.2 |

Knowledge of the clinical status of cases is not merely of academic interest but has definite administrative value. Clinical status, in addition to the stage of disease, laboratory findings, family conditions, and so forth, determines the amount of supervision the patient and his contacts require. During 1955, 107,406 public health nursing and bedside visits were made to tuberculosis patients and contacts, representing 14.6 percent of the total visits (11). With nursing time at a premium, an up-to-date register will enable the health officer to use nursing service more effectively and economically.

Hospitalization Status

With regard to the pulmonary cases classified by clinical and hospitalization status, the findings are not too dissimilar to those of 1952 (table 6). About one-quarter were hospitalized; of the active pulmonary cases slightly

Figure 3. Sputum positive and other active pulmonary tuberculosis cases not in hospital, 1955, New York State exclusive of New York City.

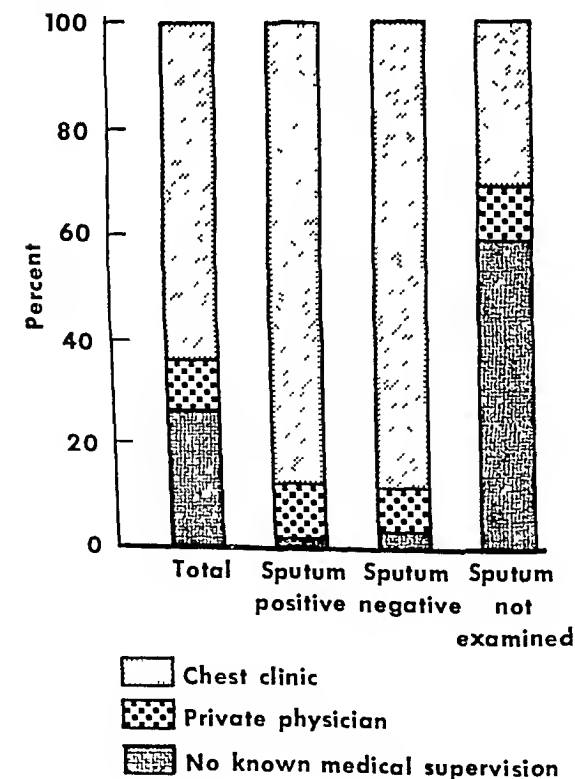
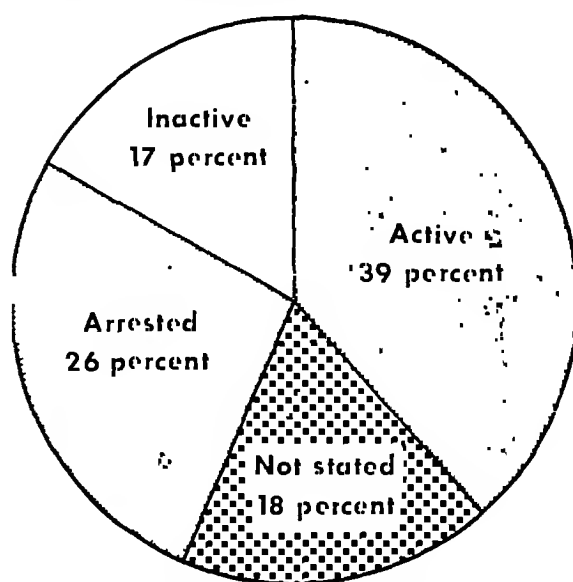


Figure 4. Clinical status of pulmonary tuberculosis cases, 1955, New York State exclusive of New York City.

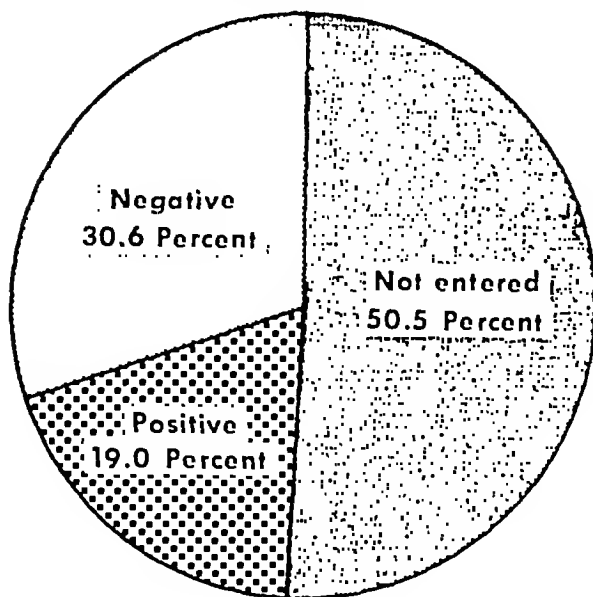


more than one-half were hospitalized. Of the nonhospitalized cases 25 percent were classified as active, 33 percent as arrested, 22 percent as inactive, and 20 percent not stated. Between 1952 and 1955 there was a decrease in the percentage of "active" and "activity not stated" groups. Nevertheless, the clinical status of nearly 2,500 nonhospitalized pulmonary cases was undetermined or not stated. Of these patients more than half were under chest clinic supervision and another 10 percent under the care of private physicians (fig. 5). It is recognized that there are delays in determining a patient's clinical status, but prolonged delays affect administrative decisions concerning contact examinations and nursing supervision. When such data are available and yet not entered on the visible register, the value of the register is vitiated.

Nearly 3,000 of the 12,585 nonhospitalized pulmonary cases were under no known medical supervision. About one-third of the 3,130 nonhospitalized pulmonary cases with active tuberculosis were under no known medical supervision (fig. 5). Since, by definition, a person on the register is in need of medical supervision, such unsupervised persons jeopardize their cure and rehabilitation and are potential spreaders of the disease.

Of 13,911 nonhospitalized cases of tubercu-

Figure 2. Sputum status of pulmonary tuberculosis cases, 1955, New York State exclusive of New York City.



effort to obtain sputum examinations and record the results are indicated.

Of 7,173 active or sputum positive pulmonary tuberculosis cases, less than half were hospitalized in 1955 (table 5). This is similar to the situation in 1952. Only slightly more than half of the 3,166 cases with positive sputum in the previous 12 months were hospitalized, practically no change since 1952. Is it not foolhardy to be complacent about tuberculosis while 3,740 patients who are either active or sputum positive, or both, remain unhospitalized where hos-

pital facilities are available? Of the 1,475 nonhospitalized sputum positive cases, 325 have never been hospitalized for tuberculosis. Nearly 300 of those hospitalized were treated for less than 6 months in hospitals.

As was pointed out in the 1952 analysis, "For many reasons, some more valid than others, it is difficult to hospitalize and keep hospitalized every case requiring hospitalization. Nevertheless, these reasons should be known and recorded and the number of cases in this category reduced for the welfare of the individual as well as that of the community" (10). It must be constantly remembered that these patients, even if under supervision, constitute a potential health hazard.

Nearly 1,000 active cases have no known medical supervision (fig. 3). Such cases certainly constitute a challenge in the control of tuberculosis. Systematic conference-type review of these cases by the local health officer, the clinician, and the supervising public health nurse could very well result in a significant reduction in the number of unsupervised cases.

Clinical Status

The clinical status, or activity at time of last report, of the 16,692 pulmonary cases in the active files is shown in figure 4. There were changes between 1952 and 1955, namely, a decrease in the percentage of "active" and "activity not stated" categories. Nevertheless, the clinical status of more than 3,000 cases was not stated or was undetermined.

Table 5. Sputum positive¹ and other active pulmonary cases, by hospitalization status, 1955, New York State exclusive of New York City

| Sputum and clinical status | Number | | | Percent in hospital |
|---|--------|--------------------------|-----------------|---------------------|
| | Total | In hospital ² | Not in hospital | |
| All cases----- | 7, 173 | 3, 433 | 3, 740 | 47.9 |
| Sputum positive in past 12 months----- | 3, 166 | 1, 691 | 1, 475 | 53.4 |
| Active----- | 2, 413 | 1, 548 | 865 | 64.2 |
| Arrested----- | 341 | 24 | 317 | 7.0 |
| Inactive----- | 117 | 6 | 111 | 5.1 |
| Not stated or undetermined----- | 295 | 113 | 182 | 38.3 |
| Sputum negative or no expectoration, active status----- | 1, 024 | 369 | 655 | 36.0 |
| Sputum not examined or no information, active status----- | 2, 983 | 1, 373 | 1, 610 | 46.0 |

¹ Cases classified as arrested or inactive may have positive sputum.
² Bacteriological status at time of admission.



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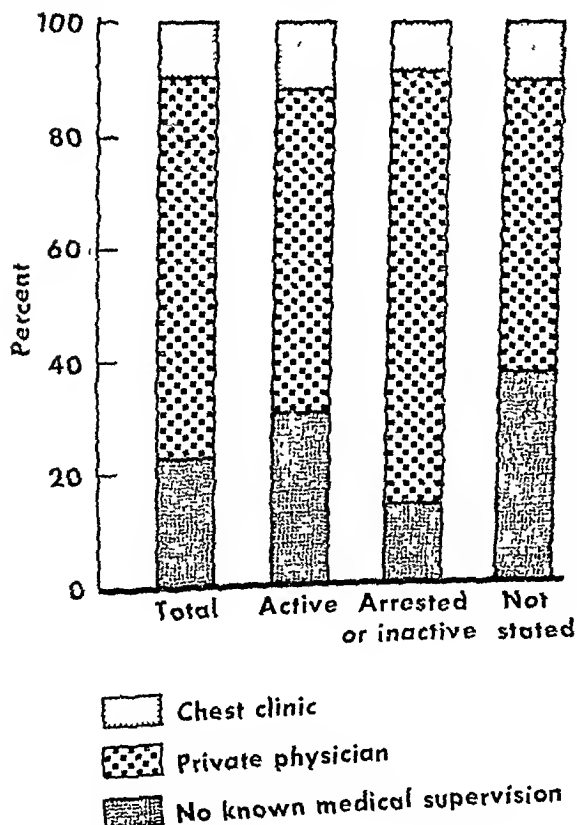
A woman in India mixes dough for chappatis, thin flat cakes of unleavened bread. These and an urn of goat's milk will be served on the family's return from work.

Table 6. Pulmonary cases, by clinical and hospitalization status, 1955, New York State, exclusive of New York City

| Clinical status | Number | | | Percent by hospital status | | | Percent by clinical status | | |
|---------------------------------|--------|-------------|-----------------|----------------------------|-------------|-----------------|----------------------------|-------------|-----------------|
| | Total | In hospital | Not in hospital | Total | In hospital | Not in hospital | Total | In hospital | Not in hospital |
| Total..... | 16,692 | 4,107 | 12,585 | 100.0 | 24.6 | 75.4 | 100.0 | 100.0 | 100.0 |
| Active..... | 6,420 | 3,290 | 3,130 | 100.0 | 51.2 | 48.8 | 38.4 | 80.1 | 24.9 |
| Arrested..... | 4,336 | 132 | 4,204 | 100.0 | 3.0 | 97.0 | 26.0 | 3.2 | 33.4 |
| Inactive..... | 2,852 | 69 | 2,783 | 100.0 | 2.4 | 97.6 | 17.1 | 1.7 | 22.1 |
| Not stated or undetermined..... | 3,084 | 616 | 2,468 | 100.0 | 20.0 | 80.0 | 18.5 | 15.0 | 19.6 |

losis (all forms) 2,451 had not been clinically observed since 1952 (table 7). From such a large number of nonhospitalized cases, many of them active, and the large group of unsupervised cases, there arises the stark realization that much more remains to be done before

Figure 5. Clinical status and type of supervision of pulmonary tuberculosis cases not in hospital, 1955, New York State exclusive of New York City.



tuberculosis may be considered as completely controlled, much less eradicated.

Many of the patients not heard from for 12 months or more, and possibly even some with more recent cases, have undoubtedly moved away, died (without mention of tuberculosis on the death certificate), become lost, or have had inactive tuberculosis for the time period specified for transference from the administratively active file to the closed file. Some patients, despite positive sputum, may be considered as having attained maximum hospital benefit. And, of course, hospitalized patients on weekend passes with the extensive liberty to associate with such susceptible groups as young children may truly be more of a hazard than some nonhospitalized patients who are effectively isolated by geographic, economic, and social conditions.

Even so, substantial numbers of the supposedly known cases undoubtedly still have tuberculosis which has not been completely inactivated. In the light of new therapeutic approaches and surgical skills, many of them

Table 7. Year of last clinical observation of nonhospitalized tuberculosis cases, 1955, New York State exclusive of New York City

| Year | Number | Percent |
|------------------|--------|---------|
| Total..... | 13,911 | 100.0 |
| 1954-55..... | 9,982 | 71.8 |
| 1953..... | 1,478 | 10.6 |
| 1952..... | 788 | 5.7 |
| 1951..... | 501 | 3.6 |
| 1950..... | 336 | 2.4 |
| Before 1950..... | 824 | 5.9 |

Methemoglobinemia From Eating Meat With High Nitrite Content

By J. D. ORGERON, M.P.H., J. D. MARTIN, M.D., C. T. CARAWAY, D.V.M.,
ROSE MARY MARTINE, B.S., and GEORGE H. HAUSER, M.D.

TEN CASES of methemoglobinemia occurred near New Orleans, La., in October 1955. From epidemiological and laboratory investigations, we determined that they were due to nitrite poisoning which resulted from eating wieners and bologna containing large amounts of the chemical.

Before detailing the circumstances of the outbreak, we shall review briefly the medical aspects of methemoglobinemia and consider the use of nitrites in meat.

Methemoglobin in the Blood

Methemoglobinemia is a condition in which a part of the hemoglobin has been oxidized to methemoglobin with a consequent reduction in the oxygen-combining and oxygen-carrying power of the blood. The oxidation may be caused by absorption, inhalation, or ingestion of large doses of certain chemicals, particularly the nitrites, nitrates, sulfonamides, and aniline derivatives.

Onset of symptoms is sudden, usually within 1 or 2 hours after contact with, or ingestion of,

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the poison. The symptoms include nausea, vomiting, profuse sweating, and an intense cyanosis of the fingertips, nose, and ears.

Mild cases of methemoglobinemia result when less than 50 percent of the hemoglobin is oxidized to methemoglobin. After 70 to 80 percent is oxidized, there is a progression of ataxia, dyspnea, excessive salivation, prostration, and unconsciousness. Oxidation of 90 percent or more is fatal unless immediate treatment is given (1).

A presumptive diagnosis of methemoglobinemia should be made if there is a history of rapid onset of cyanosis without physical findings of cardiac, pulmonary, or intracranial disorder. A history of ingestion of a substance containing nitrites or nitrates within the past few hours aids in establishing the diagnosis. If cyanosis is unrelieved by oxygen therapy and if blood withdrawn from a vein shows the characteristic chocolate-brown coloration, the diagnosis is almost certain (2).

A definitive diagnosis of methemoglobinemia can be made with the laboratory procedure reported by Evelyn and Malloy (3). This procedure, which uses a single sample of blood from the finger, is an accurate photoelectric method of determining the oxyhemoglobin, methemoglobin, and sulphemoglobin levels of the blood.

Methylene blue is an effective antidote for toxic methemoglobinemia. The recommended dosages are 1 mg. of methylene blue per kilogram of body weight for adults and 2 mg. of methylene blue per kilogram of body weight for children. These amounts should be injected

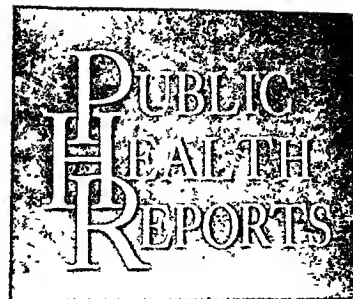
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Jerry Solon, Dean W. Roberts, Dean E. Krueger and Anna Mae Baney.

58 pages; illustrated. A summary and information on availability appear on pages 279-281.



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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE
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The remaining 8 patients exhibited symptoms similar to the first 2, and all responded well to treatment with methylene blue. Seven had eaten wieners and one had eaten bologna, all manufactured at the same plant.

Of the 10 persons ill in this outbreak, 8 were between the ages of 1½ and 5 years. For this group the interval between eating the meat and onset of symptoms was 2 hours. The other 2 patients were 10-year-olds, and the time lapse between eating the meat and onset of symptoms was about 6 hours.

Inspection of the Plant

After the report of the third case and the finding of excessive quantities of nitrite in the wieners, State and local health department sanitarians were notified to place under seizure all retail stocks of wieners manufactured by the meat plant in question. Later, when the case in which bologna appeared to be the cause was reported, some retail stocks of bologna manufactured by this plant were also seized. One or more samples from each lot of meat placed under seizure were sent to the State chemical-toxicological laboratory for nitrite determinations.

In 131 samples of the assorted meat products, nitrite concentrations varied from 3.3 p.p.m. to 6,570 p.p.m. Seventeen of the samples (14 of wieners and 3 of bologna) contained nitrites in excess of the maximum allowable of 200 p.p.m. The lots from which these samples were taken were destroyed by burning.

In an effort to determine the conditions responsible for the excessive amounts of nitrites in these meat products, we subsequently made an inspectional tour of the manufacturing plant. (This plant does not use Federal, State, or local meat inspection services.) The general manager and the sausage production manager of the plant explained each operation in the wiener and bologna manufacturing process, with particular emphasis on the mixing and blending operations.

In preparing wieners or bologna, approximately 400 pounds of coarsely ground meat and meat products are added to a silent cutter, along with ice for cooling, a prepackaged spice preparation, and 1.5 pounds of a commercially pre-

pared powder containing nitrite and nitrate. This powder is composed of approximately 6 percent sodium nitrite, 4 percent sodium nitrate, 87 percent sodium chloride, and 3 percent moisture. After 12 to 20 minutes in the silent cutter, the material is conveyed to the stuffing room, where the artificial casings are filled. Samples of the artificial casing contained only a trace of nitrite.

During our inspection of the spice storage room, we noticed an unopened container of "pure" sodium nitrate powder. On close questioning concerning the use of this powder, the sausage production manager stated that this material was just recently obtained. The commercially prepared nitrite-nitrate powder produced too fast a "cure" on some products, he explained, and he had ordered the "pure" sodium nitrate to correct this difficulty. He knew of no "pure" sodium nitrate compounds ever having been used in the plant.

Since the commercially prepared powder contained only 10 percent sodium nitrite and sodium nitrate, about 36 to 40 pounds of this material would have to be added to a 400-pound batch of meat to provide the concentration of 6,570 p.p.m. found in one sample of wieners. The amount of sodium chloride contained in 36 to 40 pounds of the commercial preparation would have made the wieners very distasteful. Hence, it would seem that a product containing a larger concentration of nitrate or nitrite (or both) than the powder would have had to be used to result in the quantities of nitrite reported by the laboratory.

After our tour of the plant, we obtained information regarding personnel changes during recent months, disposition of broken and imperfect wieners, records of nitrite and nitrate inventories, and routine laboratory controls on the meat products. Investigations of these items, however, did not help us determine how the excessive quantity of nitrite got into the wieners and bologna.

Many safeguards were taken to insure the accuracy of the chemical analyses. Two laboratories in addition to the State chemical-toxicological laboratory analyzed samples of the meat products, and all found similar nitrite concentrations. Laboratory examination of the commercially prepared powder used at the

intravenously over a 5-minute period. Dosages should not exceed 7 mg. per kilogram since toxic effects such as dyspnea, precordial pain, restlessness, a sense of oppression, apprehension, and fibrillar tremors may occur (1).

Numerous cases of methemoglobinemia have been traced to the consumption of well water containing large amounts of nitrates (4-7), contact with aniline dyes used in crayons (8-11) and laundry marking ink (12, 13), accidental ingestion of leather dyes and furniture polish (2), and ingestion or absorption of varied medications containing hemoglobin oxidizing components (14-16). Only a few outbreaks have been reported in which the causative agent was contained in food. One of these was an outbreak in New York City in which 11 aged men who had eaten breakfast at the same cafeteria were affected. Investigation showed that sodium nitrite was used in place of table salt in the seasoning of the oatmeal they had eaten (17). Another was an outbreak of acute toxic methemoglobinemia among a group of people who had eaten wheatcakes and "maple sirup" at a diner in Syracuse, N. Y. In this outbreak, investigation revealed that a commercially prepared corning extract containing 8 percent nitrites, 4 percent nitrates, and sucrose was inadvertently served as maple sirup to the affected individuals (18).

Nitrites in Meat

Nitrites and nitrates are used in curing meats mainly because of their color-fixing qualities, although these substances also have some preservative properties. When added to meat, sodium nitrate (Chile saltpeter) or potassium nitrate (saltpeter) is reduced to the corresponding nitrite by the action of certain bacteria that occur naturally in the meat and on processing equipment. The nitrites are further broken down by hydrolysis to form nitric oxide. This simple compound combines with the muscle hemoglobin (myoglobin) of the meat to form a more permanent pink substance, nitric oxide myoglobin. This pigment is more stable than the natural pigment found in blood and muscle fibers and is also more resistant to the action of air, heat, and bacteria (19).

Federal meat regulations and most of the

State food and drug regulations prohibit the use of more than 200 p.p.m. of nitrite in meat products for human consumption. These regulations also require that products containing nitrates and nitrites be labeled to that effect.

The amount of nitrite that can be utilized by meat is limited by the amount of myoglobin originally in the muscle tissues. The addition of excessive amounts of nitrites will not increase or intensify the color, but it may have an adverse effect on the meat.

Circumstances of the Outbreak

The Louisiana State Department of Health first learned of the outbreak of methemoglobinemia in the New Orleans area from a report of two cases from a practicing pediatrician.

The first patient was a 2-year-old girl who became ill about 2 hours after eating 2 wieners. Symptoms, as observed by the child's mother, included profuse sweating, vomiting, and a bluish-gray cyanosis around the lips and nails. The family physician was called immediately, and the child was hospitalized with a presumptive diagnosis of methemoglobinemia. The child responded well to an intravenous injection of methylene blue and was discharged from the hospital the following day.

Specimens of the vomitus, which contained particles of wieners, and samples of wieners obtained from the same package from which the meal was prepared were submitted to the chemical-toxicological laboratory of the State health department for determination of the nitrite content. Chemical analysis showed that the vomitus contained 11.8 p.p.m. of nitrite and that the wieners contained 5,420 p.p.m. of nitrite.

The following day the second case of methemoglobinemia was reported in a 3-year-old boy. Speech disturbance and cyanosis of the lips and nails were observed about 2 hours after the child had eaten 2 wieners manufactured by the same meat plant that prepared the ones eaten by the first patient. The child recovered rapidly after hospitalization and treatment with methylene blue injected intravenously. Samples of the wieners obtained from the same package as those eaten by this child contained 5,420 p.p.m. of nitrite.

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techniques

Soda Fountain School

Employees of Cleveland's 600 drug stores will be trained at the School of Soda Fountain Sanitation operated in the city hall by the Cleveland Division of Health. Graduates will receive a food-handler's button to wear on their uniforms.

Designed to reduce the need for enforcement of sanitary regulations, the school's short course combines audience participation, group discussion, and role playing in four 2-hour sessions. Students are told and shown why a clean, colorful fountain will attract new customers, establish a regular clientele, increase sales for the drug store, and add pennies to their own pockets.

Classes began January 2, 1957. They are open to fountain employees of independent and chain stores throughout the Cleveland area in first-come, first-served order. Owner-manager representatives of the drug stores are encouraged to attend at times not used by their employees. Eventually, the course



will be offered to applicants attending high school.

The classroom seats 35. To one side is a fully equipped luncheonette, complete with mechanical dishwashing, refrigeration, and cooking facilities. All of the equipment has been donated by manufacturers and associations. Teaching aides include motion pictures, slides, flip charts, bulletin boards, pamphlets, checklists, and self-inventory sheets. Three regular and two guest instructors conduct the classes and give

everyone individual attention when needed.

On completing the course, each graduate receives a permanent number, a card, and a button. Some of the stores have agreed not to employ new help until they have earned the food-handler's button.

Every store sending all of its employees through the course receives a certificate for public display if it also has had no sanitary violations. The certificate is revokable when violations are found.

plant indicated that it did not contain more than the 10 percent sodium nitrite and sodium nitrate indicated on the label. The salt content of the wieners manufactured by the plant was found to be within normal limits.

Laboratory analysis of samples of wieners manufactured by other plants using the same commercial nitrite-nitrate preparation did not show the excessive amounts of nitrites found in the products of the plant under suspicion.

Bacteriological examination of samples of the suspected meat products did not reveal any organisms of the food-poisoning type.

Although we were unable to determine exactly how the additives were applied to the meat products to result in the excessive concentrations of nitrite, it seems most likely that a product containing a large quantity of nitrate or nitrite (or both) was mistakenly added to one or more batches of the wiener and bologna mixtures. Since the inventory controls of the additives were haphazard and the code dating of the meat products was unreliable, we were unable to learn the date that the incident occurred. Had this information been available, we could have directed our investigations to the events of the day in question.

Summary and Conclusion

In October 1955, an outbreak of 10 cases of methemoglobinemia occurred in the New Orleans, La., area. Early evidence pointed to the ingestion of large amounts of nitrite in wieners and bologna as the cause.

Investigation revealed that 9 victims had eaten wieners and 1 had eaten bologna manufactured by the same plant. Laboratory analysis of 131 samples from retail stocks of meat products manufactured by this plant indicated that 17 samples contained nitrite concentrations in excess of 200 p.p.m., the maximum amount permissible under Federal and State regulations. The concentrations ranged up to 6,570 p.p.m. A commercially prepared powder containing 10 percent sodium nitrite and sodium nitrate was used routinely in preparing the wieners and bologna.

Exactly how the excessive quantity of nitrite got into the meat products could not be determined. It seems likely, however, that a

product containing a larger quantity of nitrate or nitrite (or both) than the commercially prepared powder had been added by mistake to one or more batches of the wiener and bologna mixtures.

This outbreak demonstrates the need for effective meat inspection services in all meat packing plants. An official meat inspection program should be the aim and eventual goal of every State and municipality. In the meantime, all owners and employees of meat plants should be made aware of the dangers of careless handling of nitrates, nitrites, and other chemical additives.

• • •

Since the occurrence of this outbreak, a similar incident was reported in Florida. Two children, a 4-year-old boy and a 15-month-old girl, from the same household became ill after eating uncooked wieners. The subsequent death of the 4-year-old child has been attributed to eating the uncooked wieners.

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A decline in the incidence of the venereal diseases would demonstrate effective control measures.

A reduction in the number of persons voluntarily seeking diagnosis for a venereal disease would indicate a decline in the index of suspicion on the part of the public. Such a decline might result from the conviction that venereal disease is no longer a problem.

A drop in the number of diagnosed cases reported and a reduction in direct epidemiological efforts to find suspects could result from reduced emphasis by health departments on all phases of the control programs. Reduced program content and emphasis, furthermore, may be measured by the amount or proportion of funds available to State and local health departments for venereal disease control. An analysis of the Montana central registry records demonstrated that this State's decline reflected incomplete reporting rather than true incidence. Renewed program emphasis, which included (a) the resumption of the former practice of mailing a confidential report form with all of the positive serologic reports and (b) resumption of visits to physicians to determine the diagnostic status of persons with positive serologic tests, resulted in an immediate increase in the number of reported cases.

In Montana, in July 1946, the venereal disease control program was given special em-

Table 1. Source and amount of funds budgeted for venereal disease control and number of cases of syphilis reported in Montana, fiscal years 1947-54

| Fiscal year | Funds for venereal disease control | | | Number of cases of syphilis reported |
|-------------|------------------------------------|---|----------|--------------------------------------|
| | Federal grant | Estimated value of generalized services contributed at State and local levels | Total | |
| 1947----- | \$29,300 | \$13,985 | \$43,285 | 489 |
| 1948----- | 28,400 | 20,279 | 48,679 | 682 |
| 1949----- | 29,300 | 23,523 | 52,823 | 494 |
| 1950----- | 25,600 | 25,232 | 50,832 | 291 |
| 1951----- | 17,900 | 32,717 | 50,617 | 187 |
| 1952----- | 17,300 | 26,598 | 43,898 | 185 |
| 1953----- | 17,300 | 21,551 | 38,851 | 125 |
| 1954----- | 0 | 20,608 | 20,608 | 44 |

Table 2. Amount of funds from all sources available for support of State and local health departments and percentage budgeted for venereal disease control, Montana, fiscal years 1950-54

| Fiscal year | Total funds all sources ¹ | Amount allocated for venereal disease control |
|-------------|--------------------------------------|---|
| 1950----- | \$645,115.23 | \$50,832 |
| 1951----- | 730,881.71 | 50,617 |
| 1952----- | 767,183.83 | 43,898 |
| 1953----- | 839,440.05 | 38,851 |
| 1954----- | 836,340.39 | 20,608 |

¹ Mental health excluded.

phasis under the direction of an epidemiologist trained in venereal disease control. The growing importance of this phase of the work of State and local health units was reflected by the amount of State and local funds directed toward venereal disease control. From \$43,285 in the fiscal year 1947, funds increased to \$52,823 in 1949. Beginning in fiscal year 1950, the total amount of funds from all sources for venereal disease control declined rapidly, and by 1954 the total amount expended was only \$20,608, a decrease of 61 percent.

The number of reported cases of syphilis decreased from 291 in the fiscal year 1950 to 44 in fiscal year 1954, a decline of 84.9 percent. The amount and source of funds available for venereal disease control and the number of reported syphilis cases for fiscal years 1947-54 are shown in table 1. Table 2 shows the amount of all funds available to State and local health departments and the amount allocated to venereal disease control. The relation between the reduction in program emphasis and content as shown by the expenditure of funds and the decline in the number of syphilis cases reported is shown in figure 1.

If nothing more were known about the number of persons in Montana who had positive diagnostic tests for syphilis, it could be assumed that the State health authorities were merely exercising good judgment in reducing the amount of funds devoted to this program in about the same proportion that the disease was declining within the State. However, other data accumulated by the Montana State Board

Evidence that the content and emphasis of a syphilis control program has a greater influence over the number of cases reported than does the rise and fall in the rate of infection is adduced by one State's experience. In Montana, State board of health field work and central office efforts materially increased the number of current cases reported.

Syphilis Morbidity Reporting in Montana, 1950-54

By ARCH B. CLARK, G. D. CARLYLE THOMPSON, M.D., M.P.H., and FLORENCE KEHR, M.A.

THE MOST commonly employed measure of the incidence of syphilis within each reporting jurisdiction is the number of cases reported for the first time to State health departments. While morbidity reports comprise the principal State-by-State criterion for determining trends in the incidence of disease and evaluating public health programs, there is ample evidence that the number of cases of syphilis reported over a given period oftentimes is influenced more by the content and emphasis of the control program than by a rise or fall in the rate of infection. A classic example of this is the abrupt rise in reported cases of early latent syphilis during mobilization for World War II. The results of serologic tests for syphilis performed as part of selective service examination were directly responsible for the increased reporting of this disease.

Dramatic swings in reported morbidity such as those resulting from selective service examinations are easy to detect and interpret. It is

the subtle influence of local changes in program content and emphasis upon morbidity reporting which is difficult or impossible to detect through the routine analysis of morbidity reports. Because of the unknown factors, reported morbidity is, at best, only a crude index of trends in the control of syphilis within an individual State. Consequently, by themselves, these data may not be considered a reliable index upon which to base the program needs of a single jurisdiction.

No qualified observer will question that real progress has been made, particularly in the past 10 years, in the control of syphilis in the United States. However, just how much of the recent downward trend in reported morbidity reflects declining incidence, "under-reporting" of known cases, and case-finding failures is still a matter of speculation.

A decline in reported morbidity may result from one or more of the following factors:

1. An absolute drop in incidence or prevalence, or both.
2. A reduction in the number of infected persons seeking a diagnosis.
3. A drop in the number of diagnosed cases reported.
4. A reduction in the direct epidemiological efforts to detect suspects.

Mr. Clark is health program representative and Mrs. Kehr is records adviser with the Public Health Service, Region 8. Dr. Thompson is executive officer and secretary, Montana State Board of Health, Helena.

with cards for cases which had been reported by number or initials in 1946 or previous years. Undoubtedly there are a few Smiths and Joneses who actually were reported as cases by initials or number, 4 or more years ago, who are still receiving post-treatment serologic checks. However, since the average post-treatment observation period is probably considerably less than 3 years, the actual number of post-treatment cases taken into this study will not materially affect the overall results.

The 3,521 cases active during the period January 1, 1950–April 31, 1954, were classified as follows:

| <i>Diagnostic status</i> | <i>Number</i> | <i>Percent</i> |
|---|---------------|----------------|
| A. Diagnosed cases reported by name on State confidential morbidity report card..... | 671 | 19.1 |
| By private physician..... | 509 | |
| By clinic, hospital, or institution.. | 162 | |
| B. Cases for which central registry cards showed that a positive diagnosis of syphilis had been made but case was otherwise unreported ¹ | 440 | 12.5 |
| C. Two or more specimens examined, all tests positive..... | 523 | 14.9 |
| D. Single specimen examined, all tests of a battery positive..... | 1,168 | 33.1 |
| E. Single specimen examined with positive results and with at least one of battery of routine tests negative.. | 561 | 15.9 |
| F. Two or more specimens examined with both positive and negative results from combined battery of tests.. | 158 | 4.5 |
| Total..... | 3,521 | 100.0 |

¹ Cards for this group included those marked "control of treatment," showing that drugs had been ordered or consultation regarding treatment had been recorded, or those indicating epidemiological evidence of infection. "Epidemiological evidence of infection" involved:

(A) Central registry cards noting that the person with a positive blood test had been named as a contact of a case of primary or secondary syphilis. This was considered "epidemiological evidence" provided (a) the person was in the sexually active age group and (b) the positive blood test was subsequent to the contact report.

(B) A central registry card identified a young person with a positive test for syphilis as the child of a syphilitic mother.

The distribution of these cases by calendar year is shown in table 3.

The data in table 3 fall into three major categories of two groups each: (a) "known"

cases of syphilis, groups A and B; (b) probable cases, groups C and D; and (c) equivocal cases, groups E and F. The known cases include those for which a morbidity report has been received and those for which there is definite evidence of a diagnosis having been made. The probable cases include persons who have had one or more specimens examined for syphilis, with all tests of a battery positive and with no negative results. The equivocal cases include individuals whose serologic tests for syphilis, in addition to one or more positive reactions, resulted in one or more negative reactions. It is recognized that cases with false-positive results may be included in the probable group. On the other hand, the equivocal group, particularly group F, those with multiple STS, also must contain a significant percentage of treated but unreported cases.

It is impossible from the original data to determine the exact number of cases actually included in each of the last four categories. In order to take into consideration compensating errors in the data, when discussing morbidity reporting and case holding, the entire equivocal group has been dropped from the final analysis. It is assumed that the number of individuals with false-positive tests appearing in the "probable" group was no greater than the number of "cases" in the equivocal group. This seems to be a reasonable assumption inasmuch as the equivocal group comprises 20 percent of the total.

The total number of cases in the "known" (diagnosed) and probable categories are shown, as they occurred each year, in table 4. Also included is the number and percentage of cases within each group of these two categories. The percentage of cases in each one of these groups compared with the total cases in all groups is shown in table 5. It is evident that, had full advantage been taken of all diagnostic opportunities and had all cases been reported, some 3,050 cases of syphilis would have been reported during the 5-year period rather than 691 (table 4), a more than fourfold increase. The relationship between the cases actually reported and the potential number in the "known" group which might have been reported is shown in figure 2.

In 1950, more than 70 percent of the total

of Health demonstrate that the decline in reported morbidity of syphilis is more the result of under-reporting and case-holding failures—"suspects" who failed to remain under observation until a diagnosis had been established—than of a decrease in prevalence of this disease. Analysis of the State's morbidity reports and records of positive serologic tests for syphilis in the State laboratory demonstrates the amount of presumptive syphilis in Montana.

Central Registry

Since July 1, 1947, the Montana State Board of Health has required that all cases of syphilis be reported by name and address of the patient. Prior to this date, the regulations were satisfied by reporting cases by initials or case numbers. However, for many years it has been the practice of Montana physicians, clinics, or institutions, when sending specimens to the State laboratory for a serologic test for syphilis, to identify the donor of the specimen by full name and frequently by address and other identifying information. These two means—reporting cases by name and address and laboratory report forms which identify the person under observation by name and address—were used to prepare the "central registry" of syphilis

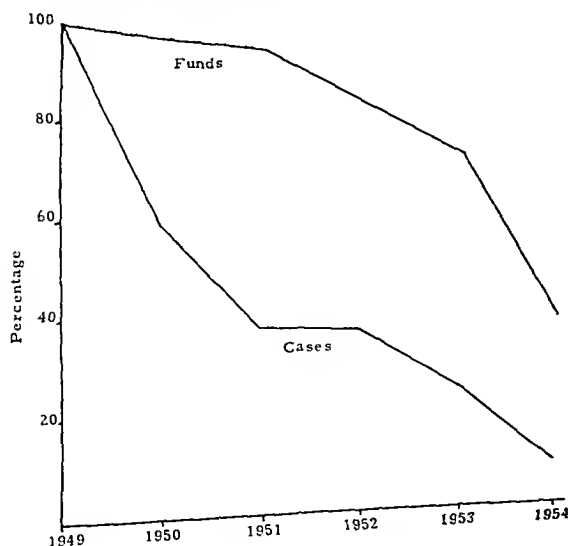
"cases." This file was set up in July 1947 and was prepared from lists of all known cases of syphilis previously reported by name, to which were added the names of all individuals for whom positive serologic tests had been reported. New names were added routinely from incoming morbidity and laboratory reports.

Forms provided by the State laboratory to accompany specimens sent in for serologic tests requested, in addition to the name and address of the person, the "reason for test," that is, whether "premarital," "prenatal," "diagnostic," or "control of treatment." Whenever this information was supplied, it was also entered on the central registry card.

Once a central registry card was prepared, all subsequent information pertaining to the case was recorded on that card. For example, if the first information was a positive blood test, and a morbidity report was received later from a physician, the date of the morbidity report and the identification of the reporting physician were added to the card. Other information added from time to time over the last 7 years included such items as requests from physicians for shipment of antiluetic drugs, abstracts of correspondence relating to the case, and epidemiological information. Since central registry cards are prepared for named individuals only, duplicate cards are limited to those resulting from (a) gross differences in spelling of the same name on two or more original documents, or (b) changes in surnames of women upon marriage. The first source of error is probably a minor one because supplementary information, such as a city and street address, attending physician, and clinic or institution, was checked with the central registry card for phonetically similar names. Since the caseload is heavily weighted by males, the second source of error may also be minor.

Data for this paper were obtained by an analysis of all material on file in the State board of health as of April 30, 1954. A total of 3,521 central registry cards, all of which had been active since December 31, 1949, were tabulated. Cards which were active only during the period 1947-49 were excluded in order to reduce to a minimum the error resulting from the inability to collate cards for named individuals who had positive serologic tests

Figure 1. Ratio between funds budgeted for venereal disease control in fiscal year 1949 and number of cases of syphilis reported in Montana during 1950-54.

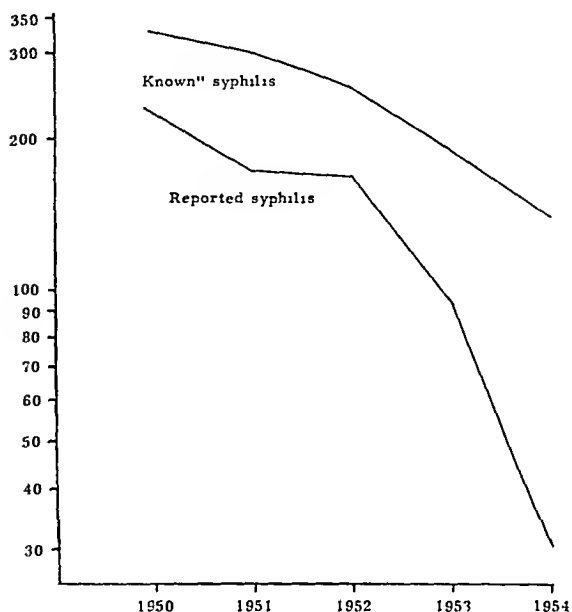


syphilis, particularly in the past 2 years, it is apparent that many of the 1,271 persons in this group simply failed to return to the physician for results of the first test or failed to keep appointments for subsequent evaluation. It is also assumed that very few of this group received therapy for syphilis. It is reasonably certain that some of these 1,271 individuals will develop syphilitic psychoses. They will continue to populate the State mental hospitals. Others will become cardiac invalids. These are the tragedies of late untreated syphilis.

Table 5 also shows the percentage of the total known and probable cases of syphilis made up by each of the above groups. The reported cases decline from a high of 29.4 percent in 1952 to 5.9 percent in 1954. The unreported diagnosed cases do not vary significantly from the 15.7 percent average. The probable cases with two or more specimen examinations average 18.7 percent of the entire probable group. This percentage varies from 15.3 percent in 1952 to 32.4 percent in 1954. The suspected cases with a single observation comprise 41.7 percent of the probable cases. This percentage does not vary significantly throughout the entire 4½ years.

It is a matter of public concern that the State health department has no knowledge of the final diagnoses for individuals in the probable group. It may be assumed that many of the rather constant number of individuals who have had two or more specimens examined with positive results have received a definitive diag-

Figure 2. Reported cases and known cases of syphilis in Montana, 1950-54.



nosis and have been placed under treatment. However, with such strong indications of infection, it is essential for the protection of each individual that he continue under medical observation until a diagnosis is completed. Furthermore, for the protection of the public health, persons who may be in the potentially infectious stages of syphilis should be interviewed for source of infection and names of contacts.

The total number of specimens examined in

Table 5. Distribution of diagnosed and probable cases of syphilis, January 1, 1950-April 30, 1954

| Year | Total number diagnosed and probable cases | Known cases: Percentage of total cases | | | Probable cases: Percentage of total cases | | |
|-------------------|---|--|------------------------------|------|---|------------------------------|------|
| | | Group A (cases reported) | Group B (cases not reported) | Both | Group C (2 or more examinations) | Group D (single examination) | Both |
| 1950 | 826 | 27 6 | 11 5 | 39 1 | 15 7 | 45 2 | 60 9 |
| 1951 | 660 | 26 1 | 19 2 | 45 3 | 17 4 | 37 3 | 51 7 |
| 1952 | 568 | 29 4 | 15 0 | 44 4 | 15 3 | 10 3 | 55 6 |
| 1953 | 560 | 16 6 | 17 3 | 33 9 | 23 2 | 12 9 | 66 1 |
| 1954 ¹ | 188 | 5 9 | 19 1 | 25 0 | 32 4 | 42 6 | 75 0 |
| 1950-54 | 2,802 | 23 9 | 15 7 | 39 6 | 18 7 | 41 7 | 60 4 |

¹ 1 months, January-April 1954.

Note: For full definitions of groupings, see text, page 197.

Table 3. Analysis of Montana syphilis central registry, by diagnostic status and date of latest information, January 1, 1950–April 30, 1954

| Diagnostic status | Date of last information | | | | | |
|--|--------------------------|------|------|------|--------------------|-------|
| | 1950 | 1951 | 1952 | 1953 | January–April 1954 | Total |
| Known: | | | | | | |
| Group A—Morbidity report received..... | 228 | 172 | 167 | 93 | 11 | 671 |
| Group B—Morbidity report not received..... | 95 | 127 | 85 | 97 | 36 | 440 |
| Probable: | | | | | | |
| Group C—2 or more STS ¹ positive..... | 130 | 115 | 87 | 130 | 61 | 523 |
| Group D—Single STS positive..... | 373 | 216 | 229 | 210 | 80 | 1,168 |
| Equivocal, positive, and negative STS: | | | | | | |
| Group E—Single STS..... | 191 | 114 | 144 | 84 | 28 | 561 |
| Group F—Multiple STS..... | 61 | 18 | 33 | 34 | 9 | 158 |
| Total..... | 1,081 | 792 | 745 | 678 | 225 | 3,521 |

¹ Serologic test for syphilis.

“known” cases, had actually been reported on a State confidential report form but this proportion rapidly decreased to 22.3 percent in early 1954 (table 4). When the total number of “known” cases is taken into consideration, the decline in syphilis in Montana since 1950 is much more moderate than is indicated by the State’s morbidity reports. Comparative trends are shown in figure 3.

Case-Holding Failures

The “probable” group of syphilis cases is divided into two categories (table 4) those in-

dividuals who have two or more STS (classified as presumptive); and those who have had only a single specimen examined (classified as suspected). The number of individuals with a positive STS on a single specimen comprises approximately 70 percent of the entire probable group over the entire period. However, in 1950, 74.2 percent of the probable cases had a single specimen tested. In 1954, the percentage of probable cases having a single positive test was 62.9.

Although there has been a moderate decline in the proportion of cases in the probable group having only a single specimen tested for

Table 4. Number and percentage of persons observed for syphilis in Montana, according to known or probable syphilis status, 1950–54

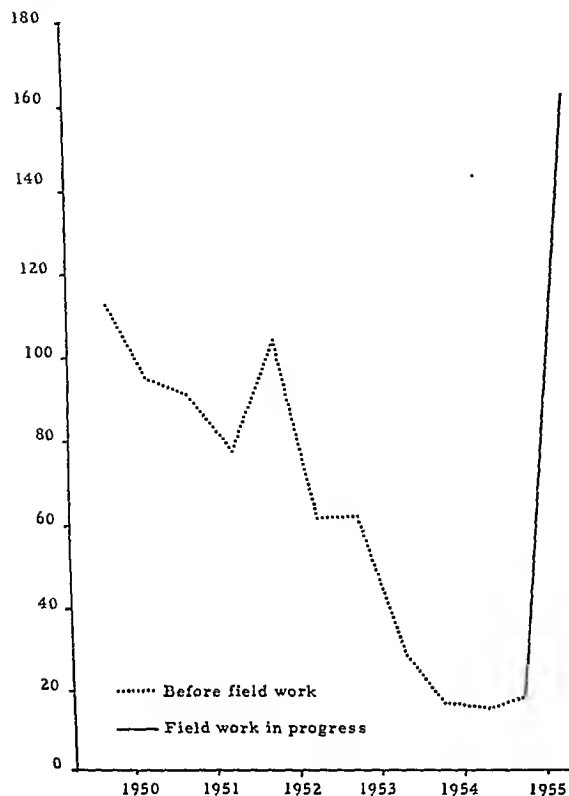
| Year | All groups | Known cases | | | | | | Probable cases | | | | | |
|------------|------------|-------------|--------------------------|---------|------------------------------|---------|-------|---|---------|--|---------|-------|--|
| | | Total | Group A (cases reported) | | Group B (cases not reported) | | Total | Group C (2 or more positive STS) ¹ | | Group D (single positive STS) ¹ | | Total | |
| | | | Number | Percent | Number | Percent | | Number | Percent | Number | Percent | | |
| 1950..... | 826 | 323 | 228 | 70.6 | 95 | 29.4 | 503 | 130 | 25.8 | 373 | 74.2 | | |
| 1951..... | 660 | 299 | 172 | 57.5 | 127 | 42.5 | 361 | 115 | 31.9 | 246 | 68.1 | | |
| 1952..... | 568 | 252 | 167 | 66.3 | 85 | 33.7 | 316 | 87 | 27.5 | 229 | 72.5 | | |
| 1953..... | 560 | 190 | 93 | 48.9 | 97 | 51.1 | 370 | 130 | 35.1 | 240 | 64.9 | | |
| 1954..... | 430 | 139 | 31 | 22.3 | 108 | 77.7 | 291 | 108 | 37.1 | 183 | 62.9 | | |
| Total..... | 3,044 | 1,203 | 691 | 57.4 | 512 | 42.6 | 1,841 | 570 | 31.0 | 1,271 | 69.0 | | |

¹ Serologic test for syphilis.

² Estimate for calendar year based on 4 months’ experience.

NOTE: For full definitions of groupings, see text, page 197.

Figure 4. Number of reported syphilis cases in Montana before and after field study, 1950-55.



physicians and hospitals in unorganized counties was delegated to a records adviser loaned to the State board of health by the Public Health Service.

Prior to the visit of State or local personnel to any area, letters from the State or local health officer were sent to all physicians to be interviewed, outlining the nature of the study and information which would be requested.

The field phases of the study began in August 1955 and, because of the vast size of the State and the limited time both State and local personnel have to devote to this work, field investigations are still continuing. By the first of January 1956, all State institutions, three of the five Indian reservations, and approximately three-fourths of the physicians and hospitals had been visited. While detailed reports on the disposition of the cases on which information was gained will not be available until the completion of the field work, the field visits and

central office activities have already had a dramatic effect upon reporting of current cases of syphilis.

For the first 6 months of 1955, the number of cases reported week by week was close to the number reported in 1954. Immediately after instituting the procedure of mailing confidential report forms with all positive laboratory reports, and following the visit of the records adviser to the first area, the number of reports of current cases of syphilis began to increase (fig. 4). By the last of October, the 43d reporting week of the year, the number of cases reported was five times that for the same period in 1954. By the end of 1955, 179 cases had been reported as compared with 31 cases in 1954, a ratio of about 6 : 1. The geographic distribution of reported cases indicates that, while there was a statewide increase in reporting, beginning with the inclusion of morbidity report cards with serologic reports, the greatest reporting gains were made in those areas visited by the records adviser.

In addition to achieving more complete reporting for syphilis, there has been a gain in the number of cases of gonorrhea and other communicable diseases reported.

Preliminary tabulations of data for 1955 would seem to substantiate the conclusions drawn from the central registry study that the major influence in the decline in number of syphilis cases reported was the result of under-reporting rather than of an absolute drop in current infections.

Summary

The number of syphilis cases reported annually in Montana has declined much more rapidly than would seem to be justified by the number of known reactors to serologic tests for syphilis.

The decline in the number of cases of syphilis reported from all sources more nearly parallels the trend in expenditures for venereal disease control by local and State health departments than it does the probable rate of infection as determined by a study of the State's central registry of reports of cases of syphilis.

During the period January 1950-April 30, 1954, 3,521 individuals with positive serologic

the State laboratory is heavily weighted by the legally required premarital and prenatal tests. This epidemiologically important group will therefore comprise the most significant portion of those persons having a single test.

Some individuals who, according to the State's record, have had a single positive STS may have a previous history of syphilis infection and will have been placed under treatment. However, those in this group who fail to remain under medical observation for sufficient time for a definite diagnosis to be made should, for their own protection and for the protection of the public, be returned to medical observation until a definitive diagnosis is established.

It is apparent that there is need not only to improve morbidity reporting in Montana but also to insure the followup and diagnosis of individuals known to have a positive serologic reaction to syphilis.

Postanalysis Activity

Upon completion of the analysis of the central registry data, plans were made, as far as limited staff and budget would permit, to utilize the information:

1. To encourage more complete day-to-day reporting.
2. To increase physicians' index of suspicion of syphilis.
3. To promote better followup of suspects.
4. To provide additional data to determine the validity of the assumptions derived from the analysis of the central office statistics and to amend the State syphilis morbidity records for each of the study years (1950-54).

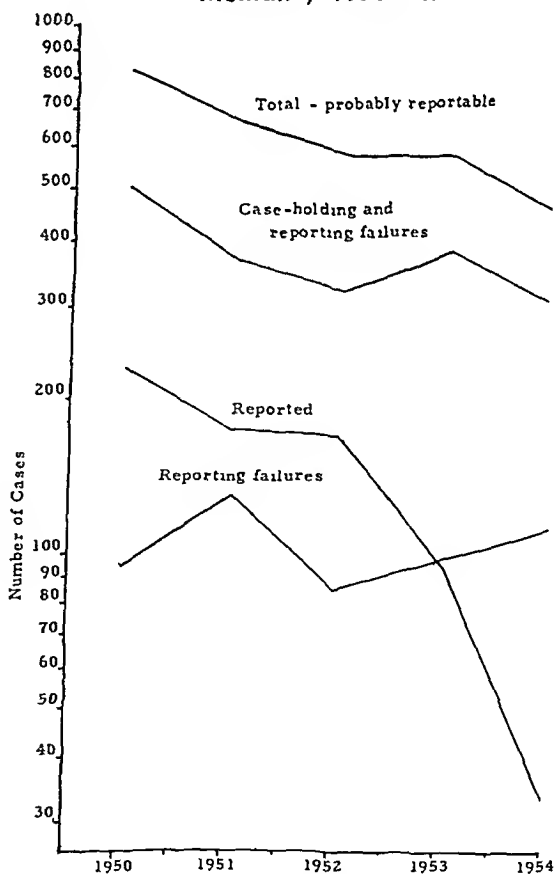
These objectives were to be accomplished by staff interviews with all physicians, including medical directors of hospitals and institutions, who had submitted positive serologic specimens:

1. To procure a morbidity report attributable to the year of diagnosis for all unreported cases of syphilis.
2. To determine the number of negative cases in the study group.
3. To learn the disposition made of unresolved cases.
4. To provide a list of suspects for future followup.

The names of persons in groups B, C, and D (table 3) were listed by city of residence, each list being subdivided into those under observation for the last time in 1950-52 and those observed in 1953 or later. Information entered on the list from the central registry cards included name, date last seen, total number of serologic specimens examined, result of latest test, and group classification. Space was provided on the forms for information gained from the interviewer's visit to the physician, including diagnosis, date of diagnosis, or other disposition if no diagnosis had been made.

Responsibility for securing the information in the field was placed with the directors of the local health districts for those cases residing within their jurisdictions. Responsibility for obtaining information from State institutions, the medical services of the Indian reservations, Veterans Administration, the hospitals, and

Figure 3. Syphilis morbidity reporting in Montana, 1950-54.



Experimental Ground Water Pollution at Anchorage, Alaska

By H. J. FOURNELLE, Ph.D., E. K. DAY, M.S., and W. B. PAGE, M.S.

UNDERGROUND WATER pollution is of prime importance to public health officials concerned with safeguarding the potability of water supplies.

A study by Stiles and associates (1) has been considered a classic in this field. An extensive inquiry into ground water pollution from experimental latrines was made by Caldwell and Parr (2). And more recently the sanitary engineering research laboratory of the University of California (3, 4) has investigated several aspects relating to the conservation of ground water by the reclamation of sewage effluents through direct recharge into the ground water.

In studying the lateral movement of simulated bacterial and chemical pollutants through ground water in an Alaskan area, our first task was to find suitable indicators which would persist during a winter in a subarctic climate. These indicators were to be traced at least 1 year to determine the limits of duration or survival.

The experimental site was a small plot of land about 2 miles south of Anchorage. The

ground water table was shallow, with the top between 5 and 6 feet below the surface of the ground. Mechanical analysis of the soil at the ground water level indicated it had a sandy-gravel texture, representative of a considerable portion of the Greater Anchorage area (5).

The test agents, the dye uranin and bacteria, were introduced directly into the ground water.

The two bacterial types most commonly used for ground water pollution studies are coliform organisms and *Serratia marcescens*. But since some coliform organisms had been found sporadically in the soil of the test site, using these organisms as indicators, we felt, would cause confusion. We therefore tried, in separate tests, three chromogens in combination and an enterococcus.

In addition to the dye and bacterial tests were cultural and biochemical studies of organisms taken from the sampling wells and the dialysis of test organisms suspended in the ground water.

Tests With Dye

The dye of choice for ground water pollution studies is uranin, the sodium salt of fluorescein.

A dosing well was dug, and a galvanized pipe 10 inches in diameter was sunk into the ground water. A ring of 9 sampling wells was placed around the dosing well at a distance of approximately 3 feet. Eight- to ten-foot lengths of 1/2-inch pipe, with 12-inch wellpoints on one end and T-connections threaded onto the other, were sunk as sampling wells. The T-connections had solid metal plugs on top to facilitate pounding

Dr. Fournelle is a bacteriologist with the Epidemiology Section of the Arctic Health Research Center, Public Health Service, Anchorage, Alaska. Mr. Day was formerly chief of the Environmental Sanitation Section of the center, and Mr. Page is the present chief. Mr. Day is now with the General Engineering Program, Division of Sanitary Engineering Services, Public Health Service, Washington, D. C.

Mrs. Clarissa Allen and Mrs. Dorothea Swan gave technical laboratory assistance during several phases of the work.

tests for syphilis were under treatment or observation. Of these, 2,802 probably had syphilis. Of this "probable" group, only 23.9 percent were so reported by physicians, clinics, and institutions while 15.7 percent were known to have been treated for syphilis but were not reported as cases. An additional 18.7 percent had had two or more positive serologic tests for syphilis.



Bricks for Peru's Houses

Encouraged by the Peruvian Government's interest in housing, we have met with housing and planning officials of the newly formed Housing and Land Reform Commission and with representatives of the Inter-American Housing Center of the Pan American Union. We have been working with a local engineer on producing and marketing "sand-lime" brick in the Lima area. The project has been negotiated, and the plant, financed by Peruvian capital, is under construction.

—ELOY A. BARREDA, *sanitary engineer, United States Operations Mission, Peru.*

Water, But None to Drink

Sudden, heavy rains, over a large part of Iran, especially on the vast plains where the central desert approaches the Zarqan Mountain, badly damaged roads and other communication facilities. After road repairs permitted us to reach remote localities, we learned that the worst health problems had developed in the flat regions, some distance from the

The largest group of reactors (41.7 percent) with unknown diagnostic status had had a single test.

Field work and central office efforts by the State board of health to determine the diagnostic status of reactors, although only partially completed, have already resulted in a sixfold increase in reporting of current cases.

mountain, where flood waters had completely destroyed the villages.

Water was the most urgent need. The villagers have no natural water supply but depend on *ghanats*, underground water canals laboriously and hazardously constructed by hand, sometimes extending for many kilometers and often reaching several hundred feet in depth. The floods had filled the *ghanats* with dirt or otherwise ruined them. Water for the villages had to be carried over long distances by man and beast.

The public health department, in the emergency, dispatched 13 teams supplied with perchloron, drugs, and typhoid vaccine.

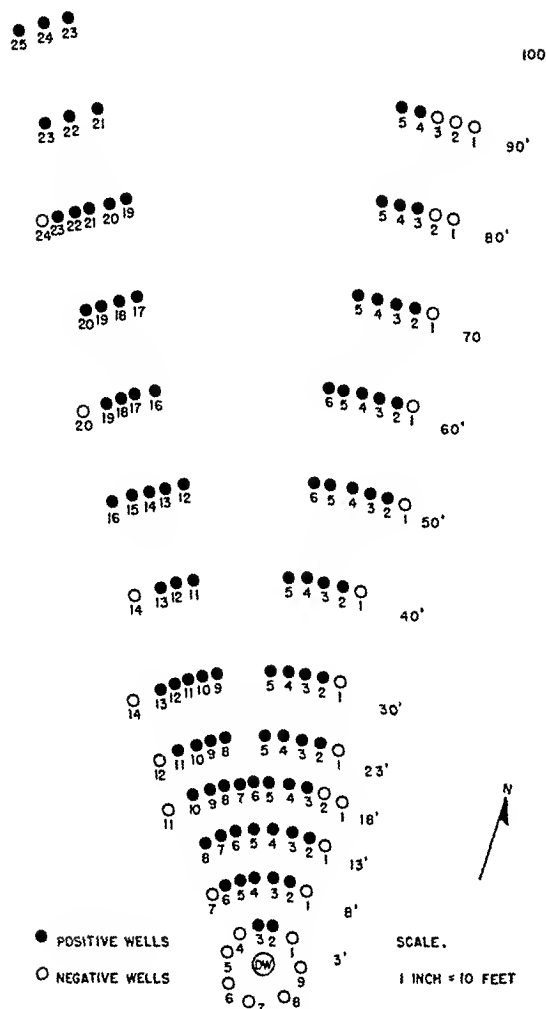
—GLEN W. McDONALD, M.D., M.P.H., *chief, Public Health Division, United States Operations Mission, Iran.*

Hospital Lottery in Iraq

In Iraq, the Mutsariff of Basrah Liwa, who recently contributed 300 dinars (\$840) toward the building of two subhealth centers, has requested a food-handlers course. Lottery funds will finance the construction of the 130-140 bed maternity hospital in Baghdad. Health films shown in the evening, twice a week, on Baghdad street corners are attracting crowds of people. The health exhibit at the agricultural fair in Sulaimaniyah was highly original: It included two mud dwellings in miniature, one sanitary and the other insanitary.

—JOHN LEWIS, M.D., *chief, Health and Sanitation Division, United States Operations Mission, Iraq.*

Figure 2. Total dye pattern, October 1951 to August 1954.



nutrient broth cultures of each of the 4 chromogens were placed in the ground water over a period of 35 days.

The water was examined for 9 weeks. It was not possible to trace the movement of these organisms. Bacteriologically, there did not appear to be any noticeable difference from the predosing examinations. A complicating factor appeared to be the large numbers of natural soil bacteria found consistently in the ground water.

It was apparent at this point that we needed some definite criteria for the selection of test organisms. These criteria were: (a) the test organism should have some specific and permanent distinguishable property, cultural or bio-

chemical, or both; (b) a laboratory test to distinguish this organism from soil bacteria should be available; and (c) the test organism should be capable of extended survival in the ground water.

Test With an Enterococcus

Certain enterococci appeared to meet the above requirements. Accordingly, a beta hemolytic, gelatin-liquefying strain, *Streptococcus zymogenes* (ATCC 4533), was obtained. (Although the culture is listed as *Streptococcus liquefaciens* in the ATCC catalog, it is designated here as *S. zymogenes* because it was beta hemolytic.) For the cultural and biochemical properties of the test organisms employed in this study, see Bergey's Manual (7).

Prior to the use of this organism, 78 samples taken from the dosing well and from 26 of the experimental test wells were examined for enterococci. Four samples were positive for non-hemolytic enterococci only.

Ten liters of 48-hour nutrient broth cultures of 2 strains of the enterococcus test organism were introduced into the ground water over a period of 11 days. A limited number of test organisms were used to see how far such a number could travel and how long they could survive.

Either 1-liter or 1-gallon samples were taken over a period of 371 days. Bacterial population was estimated by planting serial quantities of 100 ml. and less, in tenfold dilution steps, into sodium azide glucose broth (8). The remaining portion of the liter or gallon was filtered through a membrane filter (9), and the filter pad was placed in the azide glucose medium. After incubation at 45° C., positive results, as indicated by growth in the liquid medium, were confirmed by streaking a loopful of the material onto blood agar plates. The need for confirmation was pointed out by Ostrolenk and Hunter (10), who showed that false positive as well as false negative reactions occur in this medium. Microscopic examinations were made of gram-stained smears taken from the blood agar plates. Representative cultures were picked for cultural and biochemical studies.

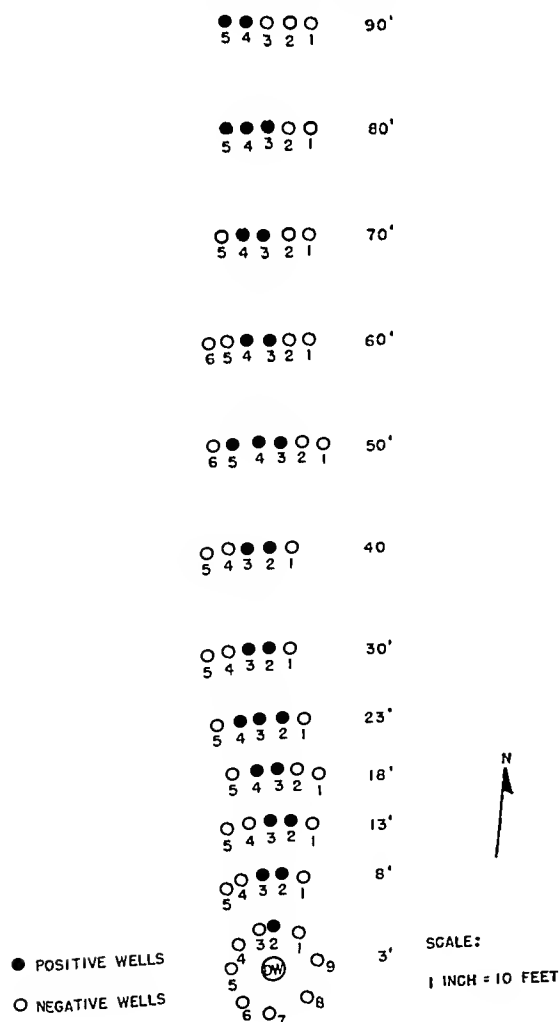
On the third day following the initial dosing,

the pipe into the ground and $\frac{3}{4}$ -inch openings on the side for connecting a suction sampling device.

The well was dosed once with 1 liter of a 10 percent concentration of uranin to determine how long this specific amount of the dye could be detected. The method of dye concentration for ultraviolet light examination recommended by the bureau of environmental sanitation of the New York State Health Department (6) was used.

On the second day after dosing, well No. 2 in the ring (fig. 1) became positive. Five or six sampling wells were then placed in arcs at 5- to 10-foot intervals in the direction of dye movement as wells became positive for the dye.

Figure 1. Original dye pattern, October and November 1951.



There appeared to be a relatively narrow channel of dye flow, between $1\frac{1}{2}$ and 4 feet wide, with well-defined negative borders. This channel was apparent for approximately 2 to 5 weeks. The rate of movement of the dye through the ground water was about 2 feet per day.

Additional positive wells, west of the original direction of flow, were found 65 days after the original dosing. This indicates a primary and a secondary flow pattern. About 9 months after the dosing, a further shift of the dye westward was found in some of the wells. Three wells on the right border of the dye pattern had become negative.

About 2 years after the original dosing, the pattern of flow was wedge-shaped, extending from the apex at the dosing well in a northwest direction to about 40 feet in width 90 feet away. The outline of the wedge was marked by negative wells. Two years and ten months after the original dosing, dye was still evident in 38 of 48 wells examined. The dye pattern indicating all wells that were positive is shown in figure 2.

Tests With Chromogenic Bacteria

Prior to initiating the bacteriological field work, samples of the soil and ground water were examined in the laboratory for bacterial chromogens, and the effects of varying concentrations of uranin on the test organisms were compared. The first study showed that chromogens were present sporadically and in small numbers. We believed, therefore, that a group of selected bacterial chromogens together would be feasible as tracer organisms. In the second study, we found that uranin had no apparent inhibitory effect on the test organisms in concentrations that might be expected in the ground water.

The organisms used were *Serratia marcescens* (ATCC 6889), *Chromobacterium violaceum* (ATCC 553), and two strains of *Bacillus globigii* (ATCC 9372 and FDM). Cultures were obtained from the American Type Culture Collection, Washington, D. C., and the United States Army Biological Department at Fort Detrick, Md.

The dosing schedule for the bacterial chromogens was begun at the same time as the dye dosing. Nineteen 1-liter doses of 24- to 48-hour

As progress was made away from the dosing well, fewer organisms were detected. The tabulation reveals that of the positive wells in each arc, one usually had a higher concentration of the test organism. This concentration ranged from a single tenfold dilution step to 4 tenfold steps.

Ninety-five days after dosing, test organisms were detected in all positive wells except 18-10. The latter became positive during the winter when sampling was incomplete because of frozen pipes and a lowered water table. The first positive sample from this well was taken on March 8, 1954. Regression of test organisms was first noted in May, about 280 days after dosing. After 295 days, the organism was not recovered beyond 30 feet; after 316 days, not beyond 13 feet; and after 327 days, not beyond 8 feet. At the end of the study period (371 days), the only well positive for the test organism was the dosing well. The complete regression is attributed mainly to bacterial die-off and to the effect of dilution. Although Caldwell and Parr (2) considered clogging of the filtration bed an important factor in bacterial regression, we do not believe it was a primary factor in this study since a limited amount of culture material was added to the ground water.

Cultural and Biochemical Studies

Further studies were made of 282 enterococcus cultures picked from blood agar plates. On the basis of hemolysis and gelatin liquefaction, these cultures were differentiated as follows:

| Number of cultures | Beta hemolysis | Gelatin liquefaction | Identity |
|--------------------|----------------|----------------------|------------------------|
| 201 | + | + | <i>S. zymogenes</i> |
| 80 | — | — | <i>S. faecalis</i> |
| 1 | — | + | <i>S. liquefaciens</i> |

Fermentation studies detected acid production in sucrose, mannitol, sorbitol, glycerol, arabinose, and raffinose. The fermentation reactions of the *S. zymogenes* cultures were very constant. Acid was produced in 5 of the 6 sugars, the exception being raffinose. Only 1 of the 201 cultures tested varied by fermenting all 6 sugars.

The fermentation reactions of the *Streptococcus faecalis* cultures were variable and, along

with the one *S. liquefaciens* culture, differed from those of the *S. zymogenes* cultures.

Dialyzing Culture Studies

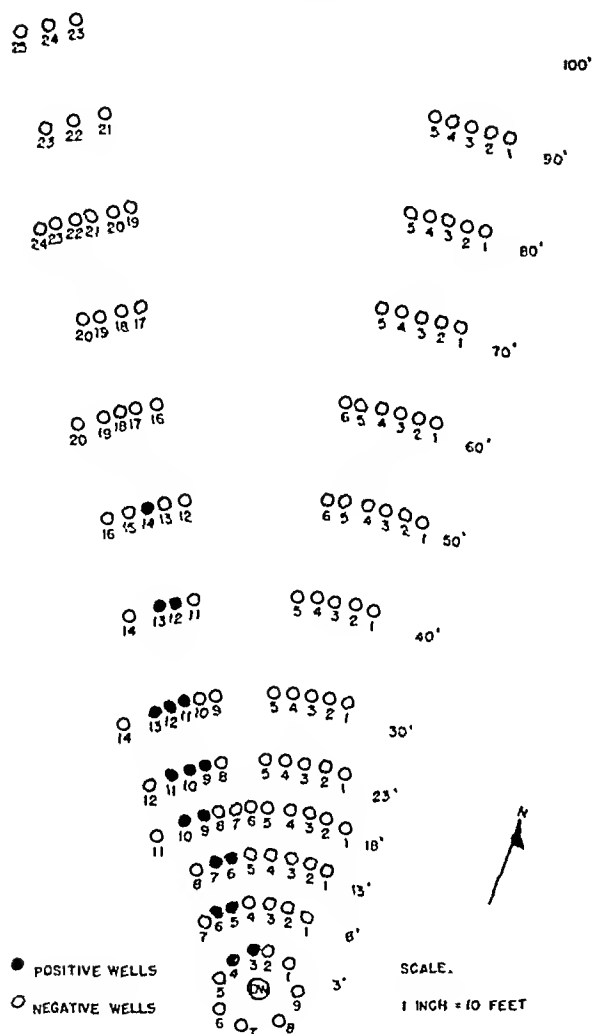
One of the factors affecting the outcome of an experimental pollution study is whether or not the test organism can survive the environmental conditions to which it is exposed. Coincidental with the tracing of the movement of the test organism through the ground water, we studied the rate and extent of die-off of 5 strains of bacteria used in two phases of the experiment. The organisms were *S. marcescens*, 2 strains of *B. globigii*, and 2 strains of *S. zymogenes*.

Nutrient broth cultures of the organisms were placed in separate dialyzing membranous sacs, made from cellophane tubing, which were then suspended in the dosing well. Exposure times varied from 24 hours to 1 year. The semi-permeable sacs retained the bacteria while permitting penetration and passage of substances in solution in the ground water into and through the membranous walls, thus simulating closely the conditions encountered by the test organisms in their travel through the ground water.

Although the rate and extent of bacterial die-off were quite pronounced for all five strains, an appreciable number of organisms survived after 1 year's exposure in the ground water. *S. marcescens* was reduced in numbers approximately 92 percent by the end of 28 days, but the surviving organisms were still well pigmented. At the end of 2 months, the decrease in numbers was 98.9 percent with some loss of pigment. After 4 months, there was no apparent further change in count, but there was a complete loss of pigmentation. Along with loss of pigment, biochemical changes, notably, a loss of fermenting powers, were also noted. The two strains of *B. globigii* showed similar losses in numbers and pigment-producing powers at the end of 28 days, and at the end of 4 months these strains were not recognizable.

The *S. zymogenes* cultures showed a progressive decrease in numbers from initial populations of 146 and 158 millions per milliliter for the two strains used to 5,800 and 4,900 per milliliter, respectively, after 1 year. Cultural and biochemical studies of isolated organisms

Figure 3. Path of test organisms, August 1953 to August 1954.



the test organism was found in the 3-foot ring of wells, and on the seventh day, in the 8-foot arc. Although this indicated a rate of movement of about 1 foot a day, it held only at those two points. The rate of flow of the test organism was irregular, averaging about 0.48 foot per day. The organism was traced to a distance of 50 feet where it was detected on the 70th day after dosing.

The test organism described a definite path of flow with sharp and clear-cut boundaries (fig. 3). The width of the path ranged between 1½ and 4 feet.

Although the organism followed a definite path, its direction did not coincide with the path of the initial dye flow observed 2 years earlier

since there had been a 26° change in the direction of the primary flow of the ground water. The path of the organism was still within the limits of the large wedge-shaped pattern formed by the dispersion of the dye. The reason for the change in direction of the ground water is not definitely known. However, there had been considerable housing construction in the area since the original dosing of the well with the dye, and the increased use of water from shallow wells may have contributed to the change in direction.

Large samples must be taken to show the test organism initially and at final sampling (see table). The bacteria gradually increased to a maximum number in most of the positive wells and then gradually decreased. This was most apparent in the wells nearest the dosing point.

Wells and samples positive for test organism

| Wells ¹ positive for test organism | Smallest amount of sample, in milliliters, showing test organism ² | | |
|---|---|--------------------------------------|----------------------------|
| | Initially | At highest concentration of organism | At final positive sampling |
| Dosing well..... | ----- | 0. 000001 | 10 |
| 3-3..... | 1, 000 | 0. 0001 | FP ³ |
| 3-4..... | 0. 01 | 0. 01 | 1, 000 |
| 8-5..... | 10 | 0. 00001 | 100 |
| 8-6..... | 1 | 0. 1 | FP ³ |
| 13-6..... | 0. 1 | 0. 01 | 10 |
| 13-7..... | 1 | 1 | FP ³ |
| 18-9..... | 100 | 1 | 1, 000 |
| 18-10..... | 10 | 10 | FP ³ |
| 23-9..... | 1, 000 | 10 | 10 |
| 23-10..... | 1, 000 | 10 | 100 |
| 23-11..... | 1, 000 | 1, 000 | 1, 000 |
| 30-11..... | 10 | 0. 01 | 1, 000 |
| 30-12..... | 1 | 1 | FP ³ |
| 30-13..... | 1, 000 | 10 | FP ³ |
| 40-12..... | 10 | 1 | 100 |
| 40-13..... | FP ³ | 10 | 100 |
| 50-14..... | 10 | 1 | 100 |

¹ Wells are designated by position in feet and well No.

² Larger portions in the tenfold stepwise inoculation scheme were, in most cases, also positive while smaller portions were negative.

³ 1-liter or 1-gallon sample filtered through sterile filter paper (FP) which was placed in azide glucose medium for incubation. This test gave the only positive result.

Uranin was found to be very satisfactory for determining direction of flow of ground water. The dye was traced 100 feet from the point of dosing and was detected 2 years and 10 months later. The path of the dye varied from an initially narrow channel, 1½ to 4 feet in width, to a wedge-shaped expansion measuring 40 feet at the distal end after several years.

A member of the enterococcus group of bacteria, *Streptococcus zymogenes*, was found to be suitable as an indicator or tracer organism to determine the extent of travel through the ground water. It was possible to trace this organism for 50 feet. The width of the path of travel varied between 1½ and 4 feet.

The several bacterial chromogens used were not found suitable as test agents in this study.

The dialyzing culture study was found to be a necessary adjunct in determining the degree of survival of the test organisms in the ground water.

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McGuinness Appointed Special Assistant



Dr. Aims Chamberlain McGuinness has been appointed by President Eisenhower as the new Special Assistant for Health and Medical Affairs to the Secretary of Health, Education, and Welfare. Dr. McGuinness replaces Dr. Lowell T.

Coggeshall, who resigned to resume his post as dean of the division of biological sciences at the University of Chicago.

Prior to his appointment, Dr. McGuinness practiced medicine in the field of pediatrics in Philadelphia. He has been a faculty member

at the University of Pennsylvania School of Medicine since 1934.

In the period 1948-51, Dr. McGuinness was director of the Children's Hospital in Philadelphia. He served as dean of the University of Pennsylvania Graduate School of Medicine from 1951 to 1954, and subsequently as clinical director of the Miners Memorial Hospital Association of the United Mine Workers Welfare and Retirement Fund. In this capacity, he was instrumental in constructing and staffing hospitals in the mining areas of Kentucky.

During World War II, he served as assistant administrator for the Army Epidemiological Board, and was awarded the Legion of Merit.

showed that the surviving organisms retained their original distinctive properties.

Discussion

The present study concerns methodology primarily, with emphasis on the selection of bacterial indicators. The need for such emphasis became apparent because of certain shortcomings of the several types of bacterial indicators first used in the study.

It has been shown that the enterococcus, *S. zymogenes*, is capable of long-time survival in ground water and possesses a high degree of permanency in its characteristic cultural reactions. Although there may be a pronounced reduction in numbers over a year's time, a sizable portion may be expected to survive if the initial or dosing numbers are sufficiently large.

The use of *S. marcescens* as a tracer organism has limitations because the pigmentation is a variable property. The failure of *B. globigii* may have been due to use of a mixture of vegetative cells and spores rather than a pure spore suspension.

In addition to those properties which favor the use of uranin as a chemical agent for tracing the movement of underground water, the dye was shown to have long-lasting properties in the soil and ground water, thereby facilitating prolonged studies of underground water flow. Because of the acid nature of the dye and the prevailing pH values of the ground water, it is believed that the dye could be used concurrently with the bacteria.

If dosing had been continuous, greater dye and bacterial concentrations would very likely have been found in the positive wells with possibly a resulting extension in the flow pattern of each agent.

The vertical depth to which the dye and test organisms penetrated was not determined.

The study has demonstrated that the rate and extent of die-off of bacterial test organisms in the ground water can be determined by dialyzing culture studies. The distance to which bacteria can travel through the soil via ground water is dependent upon the degree of survival of test organisms as well as the mechanical filtering action of the soil itself. The numbers of survivors will depend, in great part,

upon the numbers of bacteria introduced into the ground water. The findings of this investigation suggest the inclusion of a dialyzing culture study concurrently with the introduction of the test organism into the soil or ground water.

No doubt there are other suitable bacteria for ground water studies. Other enterococci which should also be suitable are *Streptococcus durans* and *S. liquefaciens*. *S. faecalis* is not recommended because it is considered to be the most common of the enterococci. Through the use of large samples, this organism was isolated many times.

The coliform group as a whole is not considered suitable since it is made up of a number of different species. The property of lactose fermentation by itself is not sufficiently distinctive. Because of the widespread nature of these organisms, the findings of small numbers in ground water could easily be confused with contamination from the surface of the ground. If a member of the coliform group is especially desired as a test organism, there is a possibility that *Escherichia freundii*, a coliform intermediate, might be suitable. The production of hydrogen sulfide distinguishes this organism from the other coliforms.

Some applications of the procedure given in this report are: (a) formulation of safe standards for water supplies with respect to location from points of pollution; (b) providing a method, where pollution of a water supply is suspected, of determining whether or not it has occurred or is possible; and (c) showing the availability of two highly specific simulants, a dye and a bacterium, for detection of other forms of contamination.

Summary

This study has demonstrated a method for tracing the movement of simulated chemical and bacterial pollutants in ground water. A procedure for evaluating the effects of the underground environment on the viability and on the cultural and biochemical properties of bacterial indicators is given. Emphasis is placed on the necessity of selecting as bacterial indicators, test organisms with distinctive and stable characteristics.

was last reported in 1944 and dog rabies (1 case) in 1950. Psittacosis was reported in all of these States but Missouri. Leishmaniasis was reported only in Florida and trypanosomiasis, only in Texas.

Holle states that the first two cases of American trypanosomiasis in this country were reported from Texas in 1955 (6). The etiological agent *Trypanosoma cruzi* was demonstrated in the cerebrospinal fluid of the second reported case. Six species of *Triatoma* in Texas have been found to be naturally infected with *cruzi*.

Forty-five of the forty-nine zoonoses known to occur in the south have been reported in Texas, according to a personal communication from the State epidemiologist and the Livestock Sanitary Commission. When the survey questionnaires were returned, rickettsialpox, leishmaniasis, glanders, and ratbite fever were not reported as occurring in Texas. However, Griffith and McNaughton (7) published a report of the occurrence of ratbite fever in Texas. Therefore, 46 of the 49 zoonoses actually occurred in Texas.

Foot-and-mouth disease has not occurred in the United States since 1928. Both Louisiana and Texas have recently been exposed to the threat of this disease, however, by the importation of a herd of Charolais cattle smuggled from Mexico into Louisiana through Texas. This stresses the need for constant surveillance against the importation of exotic diseases.

Q fever has been reported in Mississippi, North Carolina, Texas, Louisiana, and Virginia; rickettsialpox in Maryland, Mississippi, and Virginia.

Many wild animals are infected with, or are carriers of, infectious agents capable of causing disease in man. Fortunately, man's contact with these animals is so infrequent, or so casual, that it is only occasionally that human infections occur. It is good that this is so because many of the diseases of the lower animals are fatal to man.

Plague

Sylvatic plague occurs in at least 38 species of rodents in 14 States (8). Important species are: ground squirrels, wood rats, white-tailed prairie dogs, chipmunks, and marmots. The

disease is present among the rodents in the States on the plains east of the Rocky Mountains as well as in the States west of the Great Divide. The importance of sylvatic plague as a reservoir of human disease needs continuous investigation.

Murine plague is not an important disease in the United States at this time. The risk of infection spreading through ports and coastal cities must not be overlooked, however. A ship's docking and permitting infected rats to escape to the mainland is prevented only through constant vigilance and control.

Bubonic plague is the most common type of this infection in man—giving rise to about 75 percent of reported cases. The case fatality rate ranges from 50 to 90 percent. Epidemics in man always include a small number of cases of septicemia and secondary plague pneumonia. By aerogenic transfer these cases give rise to other cases of pneumonic plague. Pneumonic infections usually end in death. Seventeen human cases of plague have been reported in the United States since 1925 (8). Fortunately, the vectors of this disease have not had cause, except occasionally, to desert their rodent hosts for man. We must be constantly alert to the possibility of this occurrence, however.

Tularemia

Tularemia, a disease caused by a bacterium closely related to the bacillus which causes plague, has been reported in all the southern States except Alabama and Missouri. East of the Mississippi the common belief is that most cases in humans are contracted from the handling of infected rabbits. Of late, more cases associated with insect bites, particularly tick bites, have been found. Natural infection occurs in sheep and deer as well as in rodents such as ground squirrels, hares, and rabbits, and in certain wild birds, particularly quail and grouse.

Yellow Fever

Yellow fever, which ravaged Louisiana almost annually from its colonization until 1905, has not been reported in the southern States since that time. This pestilential disease is one that must be kept under constant surveillance, however, and mechanisms to prevent its

Zoonoses in the South

By J. D. MARTIN, M.D., M.P.H.

THE World Health Organization lists 87 diseases of lower animals transmissible to man (1). Of these, 49 occur in the southern United States (see table). As man's knowledge increases, still other zoonoses will probably be recognized, classified, and studied. The epidemiological concept of animal-to-man transmission is already broadening to include the concept of man to animal to man transmissibility of disease. The zoonoses, therefore, are of importance in human health and disease, and we need to know more concerning them.

Early Knowledge

Man's knowledge of some of the zoonoses dates back to antiquity, and control measures antedate recognition of the infectious nature of these diseases by hundreds of years. Although the exact cause of bacterial, rickettsial, and viral infections remained unknown to the ancients, they nevertheless developed a remarkable amount of useful information, including accurate descriptions of clinical entities and much detailed epidemiological information.

A pestilence associated with the presence of multitudes of "mice," probably bubonic plague, is mentioned in the Bible. Another disease, which could have been anthrax, is recorded in the Bible as destroying all the beasts—horses, asses, oxen, camels, and sheep—in the time of Moses.

Rabies was one of the first recognized dis-

eases. Kelser (2) says, "Plutarch asserted that, according to Athenodorus, it was observed in mankind in the days of the Aesculapidae, the descendants of Aesculapius, the god of medicine. Kelser also quotes Aristotle in the fourth century B. C. as writing that "dogs suffer from madness which puts them in a state of fury, and all animals which they bite when in this condition become also attacked with madness."

Tsutsugamushi fever, or mite typhus, is believed by Williams (3) to have been recognized as an entity since the 6th century A. D. Blake and co-workers (4) believe that it afflicted the natives of south China in the 16th century.

Epidemics of louseborne typhus probably occurred in any civilization whenever people lived under crowded, insanitary conditions. "In 1083 an epidemic occurred in Italy which, probably, was typhus. A few years later in 1106, another epidemic, apparently of the same disease, occurred in Bohemia. In both of these epidemics the outbreak followed famine" (5).

Current Status

In recent years much has been accomplished in the prevention and control of respiratory and enteric diseases. It is now time to strengthen, through adequate maintenance and surveillance programs, the gains that have been made against these diseases. It is time also to attack forcefully the zoonoses because of their increasing importance to health and economy.

During the period 1944-53, seven zoonoses—brucellosis, rabies, ringworm, salmonellosis, staphylococcosis, streptococcicosis, and tuberculosis were reported in all of the southern States and the District of Columbia. In the District of Columbia, however, human rabies (2 cases)

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States since 1793. Of this number, 40,000 occurred in Louisiana where, in 1905, in the final epidemic, 900 of the 8,000 persons who developed the disease died. Yellow fever is endemic in the jungles of South and Central America, especially in the rain forests. It is also endemic in Africa (10) from the West Coast, south of the Sahara desert, through the Belgian Congo into Northern Rhodesia, Nyasaland, Uganda, Kenya, and Eritrea. The threat to America is principally through air transportation of infected individuals from endemic areas of the world into the gulf coastal United States, which has been classified as a "yellow fever receptive area" because of the large numbers of *Aedes aegypti* in this area.

South American jungle yellow fever is essentially a disease of jungle animals, especially of monkeys and marsupials. For the most part, the disease in humans is accidental, occurring when humans invade the forests. African jungle yellow fever is primarily a disease of monkeys with several species of *Aedes*, especially *Aedes africanus* and *Aedes simpsoni*, the principal vectors. Should yellow fever become established in urban areas with a high *Aedes* index, such as exists in the gulf coastal area of the United States, an epidemic could result. Only constant vigilance and control of *Aedes* can prevent this occurrence.

Typhus

Murine typhus has been fairly common in the ports and towns bordering the coast. Until the advent of widespread ectoparasite and rat eradication programs, this disease had been spreading to the cities and towns of the interior of the States bordering the coast. Studies are needed on the prevalence of this disease in rat populations. Ectoparasite and rat eradication programs should be continued.

Leptospirosis

Leptospirosis is primarily a disease of rats, dogs, sheep, goats, cattle, and swine. For many years, it has been known as an occupational disease; today it is recognized as a recreational disease as well. Most cases in humans occur in persons subjected to immersion or wetting with water containing the *Spirochaeta* or working with, or around, infected animals. Studies of

rats in Nashville (11) in 1917; in Washington, D. C. (12) prior to 1918, and in Baltimore (13) in 1924 revealed, respectively, 10, 7, and 10 percent of the rats of these cities to be infected with *Leptospira icterohaemorrhagiae*. *Leptospira pomona* infection of dairy cattle and *Leptospira canicola* infection of dogs have been demonstrated in widespread areas throughout the United States.

Arthropod-Borne Virus Diseases

Four arthropod-borne virus encephalitides occur in southern States. These are caused by closely related viruses, have birds as their natural reservoirs, and are usually spread by the bite of mosquitoes and ticks. They are eastern and western equine encephalomyelitis, St. Louis encephalitis, and louping ill or encephalomyelitis of sheep. The eastern type of equine encephalomyelitis is confined largely to the east coast of the United States from Louisiana and Florida to Massachusetts. The western type has been reported in nine southern States—Alabama, Arkansas, Florida, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas. Equine encephalomyelitis is the most important infectious disease of horses occurring in the United States at the present time.

Psittacosis

Psittacosis is annually becoming of greater importance. With increasing frequency, humans are being exposed to infection in pet psittacine birds. The disease, known as ornithosis in chickens and pigeons, will probably be diagnosed more frequently in humans as physicians become more conscious of its occurrence and diagnostic tests become more readily available. Occupational disease, resulting from employment in poultry-processing plants, particularly for turkeys, is being more often recognized. Infection may follow either fleeting or prolonged exposure.

Salmonellosis

Infected animals and birds are important sources of the increasing number of *Salmonella* infections reported in humans. There are probably hundreds of unreported and uninvestigated outbreaks of salmonellosis in the southern States each year. Rarely fatal, the

entering this country need to be perfected and maintained. Jungle yellow fever is gradually moving northward from South America. It has progressed from the jungles of northern

South America through Central America into northern Honduras.

In 1907, Carroll (9) estimated that yellow fever had caused 100,000 deaths in the United

Zoonoses reported in the southern United States, by State, 1944-55¹

| Disease or vector | Alabama | Arkansas | District of Columbia | Florida | Georgia | Kentucky | Louisiana | Maryland | Mississippi | Missouri | North Carolina | Oklahoma | South Carolina | Tennessee | Texas | Virginia | West Virginia | Total |
|----------------------------------|---------|----------|----------------------|---------|---------|----------|-----------|----------|-------------|----------|----------------|----------|----------------|-----------|-------|----------|---------------|-------|
| Amebic dysentery | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 16 |
| Anthrax | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 15 |
| Arthropod-borne virus: | | | | | | | | | | | | | | | | | | |
| St. Louis encephalitis | | x | | | | | | | | x | | x | | x | x | x | | 6 |
| Eastern equine encephalomyelitis | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | | 15 |
| Western equine encephalomyelitis | x | x | | x | | x | x | | x | x | | x | | x | x | x | | 11 |
| Louping-ill infections | | | | | | | | | | | | | | | x | | | 1 |
| Aujeszky's disease | | x | | x | x | | x | | x | x | x | x | | x | | x | | 11 |
| Balantidiosis | | | | x | x | | x | x | x | x | | | | x | | | | 6 |
| Brucellosis | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| Bug bites | | x | | x | x | | | | | x | x | | x | | x | x | x | 10 |
| Cestode diseases | | x | | x | x | | x | | | | | x | | | x | x | | 10 |
| Chicken-mite itch | | x | | x | x | | x | x | x | x | | | x | | x | x | x | 10 |
| Cowpox | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 16 |
| Diphtheria | x | x | | x | x | x | x | x | x | | x | x | x | x | x | x | x | 15 |
| Endemic (murine) typhus | x | | x | | x | x | x | x | x | | x | x | x | x | x | x | x | 14 |
| Epizootic lymphangitis | | | | | | | | | | | | | | x | | | | 1 |
| Equine infectious anemia | | x | | x | x | | x | x | x | | | | x | x | | x | | 9 |
| Erysipeloid | | | x | x | x | | x | | x | x | x | | | x | x | x | x | 11 |
| Flea bites | x | x | | x | x | | x | | x | x | x | | x | | x | x | x | 12 |
| Glanders | | | x | | | | | | | | | | | x | | | | 3 |
| Leishmaniasis | | | | x | | | | | | | | | | | | | | 1 |
| Leptospirosis | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 16 |
| Listeriosis | x | x | | | x | | x | x | x | x | | | | x | | x | x | 9 |
| Lymphocytic choriomeningitis | | | x | | | | x | x | x | | x | x | x | x | x | x | x | 11 |
| Myiasis | | x | | x | x | | x | | | | x | x | x | | x | x | | 9 |
| Nematode diseases | | x | | x | x | | x | | | x | x | x | x | | x | x | | 10 |
| Newcastle disease | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 16 |
| Ovine pustular dermatitis | | | | | | x | x | x | x | | | | | | x | x | x | 6 |
| Pasteurellosis | | x | | x | x | | x | x | x | x | x | x | x | x | x | x | x | 14 |
| Pseudotuberculosis | x | | | x | x | x | x | x | | x | | | | x | x | x | x | 10 |
| Psittacosis (ornithosis) | x | x | x | x | x | x | x | x | | | x | x | x | x | x | x | x | 16 |
| Q fever | | | | | | x | | x | | x | | | | x | x | x | | 5 |
| Rabies | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| Ratbite fever | x | | | | | x | x | x | x | | x | x | | x | | | | 9 |
| Relapsing fever | | | | | | | | | | | | | | | x | x | | 2 |
| Rickettsialpox | | | | | | | | | | | | | | | | x | | 3 |
| Ringworm | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| Rocky Mountain spotted fever | x | | x | | x | x | x | x | x | | x | x | x | x | x | x | x | 14 |
| Salmonellosis | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| Shigellosis | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 15 |
| Staphylococcosis | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| Streptococcosis | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| "Tongue worm" | | | | | | | | | | | x | | | | x | | | 2 |
| Trematode diseases | | x | | x | x | | | | x | x | x | x | | x | | x | | 10 |
| Trypanosomiasis | | | | | | | | | | | | | | | | | | 1 |
| Tuberculosis | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 17 |
| Tularemia | | x | | x | x | x | x | | | x | x | | x | x | x | x | x | 15 |
| Vesicular stomatitis | x | x | | | x | x | x | x | x | x | x | x | x | x | x | x | x | 13 |
| Vibrio abortion | x | x | | | x | x | x | x | x | x | x | x | x | x | x | x | x | 15 |

¹ Information obtained by questionnaire sent to State departments of health and agriculture.

States since 1793. Of this number, 40,000 occurred in Louisiana where, in 1905, in the final epidemic, 900 of the 8,000 persons who developed the disease died. Yellow fever is endemic in the jungles of South and Central America, especially in the rain forests. It is also endemic in Africa (10) from the West Coast, south of the Sahara desert, through the Belgian Congo into Northern Rhodesia, Nyasaland, Uganda, Kenya, and Eritrea. The threat to America is principally through air transportation of infected individuals from endemic areas of the world into the gulf coastal United States, which has been classified as a "yellow fever receptive area" because of the large numbers of *Aedes aegypti* in this area.

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Salmonellosis

Infected animals and birds are important sources of the increasing number of *Salmonella* infections reported in humans. There are probably hundreds of unreported and uninvestigated outbreaks of salmonellosis in the southern States each year. Rarely fatal, the

disease causes sufficient disability to account for considerable absenteeism. Over 200 salmonellae have been identified. As our knowledge of these organisms has developed, an increasing number have been found to be pathogenic to man. Poultry, swine, cattle, sheep, rodents, dogs, and other animals have been found to harbor salmonellae capable of producing disease in man.

Rabies

It is a disgrace that rabies, almost a completely preventable disease in domestic animals, is still a threat to humans. From 1946 through 1953, 42,144 cases of animal rabies were reported in the southern States (14). Of the 14 human deaths due to rabies in the United States in 1953, 13 occurred in the southern States. In the past half century more human rabies deaths have occurred in the southern States than in all of the rest of the States combined.

Bovine Mastitis

Mastitis is a major disease problem in cattle. Because of the resultant drop in milk production subsequent to the disease, it is, economically, probably the most important disease of dairy cattle. Many organisms are capable of causing bovine mastitis but streptococci and staphylococci are the most important. Usually when one animal in a herd is infected the whole herd is soon involved. To be controlled, therefore, mastitis must be attacked as a herd problem.

Brucellosis

Another major zoonosis affecting cattle and swine which places humans at risk, as well as being extremely costly, is brucellosis. Animals, apparently healthy, will show positive blood agglutination reactions during life, and at death brucellae can be isolated from the tissues of these seemingly healthy animals. Brucellosis is one of the most serious diseases with which the animal industry has to deal. Since the widespread pasteurization of milk for human consumption, brucellosis in humans is largely an occupational disease of farm people, veterinarians, and meat handlers. The economic loss resulting from its ravages runs into millions of dollars annually.

Although human brucellosis is reported each year by State health officers to the National Office of Vital Statistics, the number of reported cases is small in comparison with the number of cases that occur in animals. Few epidemiologists, therefore, attach much significance to reported figures when thinking of incidence and prevalence. Possibly a low index of suspicion of the disease by physicians and the crude diagnostic tests available for confirmation of clinical impression contribute to the small number of human cases reported.

Anthrax

In the period 1945-1951, anthrax attacked 660 herds in the southern States and caused the death of 8,311 animals. Louisiana lost more than half of this number. Only the District of Columbia and West Virginia did not report the occurrence of anthrax during this period. No disease of livestock causes greater consternation and fear than does anthrax when it makes its appearance. It strikes quickly, spreads rapidly, causes heavy losses, and, too often, is transmitted to man. Anthrax in Louisiana, Mississippi, and Texas has been recognized since 1860 or earlier (15). In 1953, Arkansas, Florida, Missouri, Oklahoma, Texas, and Virginia accounted for 50 of the 198 laboratory-confirmed outbreaks of anthrax occurring in the United States.

Louisiana has a particularly difficult problem with anthrax. The disease is endemic there, having been reported from 55 of the 64 parishes (counties). The incidence of human anthrax is relatively high also. Heeren (16) lists 111 cases as being reported from 1920-45. Since 1945, four cases have been reported.

In June, July, and August 1954, three parishes south of New Orleans—Jefferson, St. Bernard, and Plaquemines—reported a widespread outbreak of anthrax. During this same year, sporadic outbreaks were reported in eight other parishes. About 2,000 animal deaths occurred during this outbreak and 6 human cases were reported. Investigation did not confirm the diagnosis in the reported human cases.

Tuberculosis

Tuberculosis is a major public health problem because of its transmissibility to many species of

animals—a fact which persons dealing with human tuberculosis often fail to consider. Feldman says, "The organism of bovine tuberculosis is capable of infecting swine, dogs, cats, parrots, and canaries as well as human beings; the avian tubercle bacillus, besides being pathogenic for most birds, can produce destructive disease in sheep and swine, while the human type of tubercle bacillus is capable of inducing disease in cattle, swine, dogs, and parrots" (17). According to Feldman few, if any, species of animals, warm- or cold-blooded, have an absolute resistance to the disease.

The United States Department of Agriculture has had a tuberculosis eradication program for about 30 years. At the onset of the program, 5 percent of animals tested were found to be infected. During the fiscal year ending June 30, 1954, more than 10 million (10.8 percent) of the Nation's cattle were tested for tuberculosis (18). The prevalence of bovine tuberculin reactors is now down to 0.1 percent of the animals tested. Today, with bovine tuberculosis, as with human tuberculosis, mass testing gives a very low yield of cases and is extremely costly.

Louisiana is already placing increasing emphasis on good epidemiological investigation of each active case of human tuberculosis, study of suspect contacts, and the application of mass case-finding techniques on a selective basis. The livestock industry should continue its mass testing until it can develop adequate epidemiological investigation of each known reactor and diseased animal, and, in the meantime, public health agencies should give the problem careful study. There is a need to identify, locate, and destroy all reactor animals. While this is being done, it must be remembered that healthy animals can be infected with tuberculosis by infected humans. The chain man-to-animal-to-man must always be borne in mind when unexplained reactors occur in a well protected, controlled herd.

Prevalence in Humans

Except for anthrax and rabies, I have not included figures on incidence and prevalence in humans of diseases originating in animals largely because I am sure each of you is familiar

with the human problem in your own locale, and because there is grave doubt of the significance of the low number of reported cases of some of these diseases in humans in view of the widespread occurrence of these same diseases in animals. The prevalence of these diseases among so many animals with which large numbers of our population are in frequent contact emphasizes the threat to human health.

Economic Cost

The economic impact of the zoonoses is great. I do not know the cost for the southern States as separate from the United States, but the Agricultural Research Service of the United States Department of Agriculture estimates that in the period 1942-51 the average loss on livestock and poultry from diseases, parasites, and insects amounted to \$2,688 million per year. The cattle industry is rapidly expanding in the south, particularly in Louisiana, Mississippi, and Georgia. The economy of the southern States is largely agrarian. These facts, when associated with climatic conditions which favor the propagation and spread of parasitic and other diseases of animals, strongly suggest that the southern States are bearing more than their pro rata share of the annual \$2,688 million livestock and poultry loss.

Control

Obviously, the zoonoses represent a major public health threat and a serious economic loss to States which can afford neither. It is all very well to talk about the control of brucellosis in humans, for example, through the pasteurization of all milk for human consumption and through the development of laws which would insure safe, wholesome meat. Unfortunately, measures such as these only control and decrease the number of human infections; they do not prevent the disease or eliminate its cost. Our goal should be prevention through attacking and breaking the weak link in the epidemiological chain of infection while continuing to control such diseases as occur before the chain of infection is broken.

To attack this problem properly, mechanics should be developed to assure accurate, early

reporting of the occurrence of all transmissible diseases in humans and in animals; the establishment of adequate preventive and control measures; the development of a realization of the constant threat of communicable diseases; a higher index of suspicion concerning them, and the development and utilization of better diagnostic and investigational tools and methods by practitioners of medicine, both human and veterinary.

To maintain the gains made in communicable disease control in the south, all groups interested in human and animal health and in our southern economy should join together in sharing attitudes, knowledge, information, skills, methods, and plans for preventing recurrence of the great animal plagues of the past, such as rinderpest, foot-and-mouth disease, fowl pest, Texas fever (bovine piroplasmiasis), and bovine tuberculosis, and for controlling the threats of today—rabies, psittacosis, ornithosis, brucellosis, anthrax, plague, and arthropod-borne viral and rickettsial diseases—until they too can be prevented.

Summary

The transmission of diseases from animal to man and from man to animal poses a serious threat to our health and welfare. Reasonable protective, preventive, and control measures assuring a continually improving public health status and economy will develop to the extent that veterinarians, livestock owners, research workers, economists, physicians, public health officials and others coordinate their efforts and subordinate their personal desires to the development of programs of prevention and control of the zoonoses.

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An experiment in Boston, Mass., suggests that a venereal disease agency can provide the generalized experience in public health required for graduate nursing students.

A Specialized Agency for Field Instruction in Public Health

By ETHEL M. EASTER, R.N., M.S., and NICHOLAS J. FIUMARA, M.D., M.P.H.

FOR YEARS nursing schools have been confronted with a shortage of facilities that can provide generalized field instruction in public health for their students. Some schools have been forced to abandon the practice of placing their students in field agencies; others, to restrict the number so placed because of quotas imposed by allocation committees. But, despite the shortage, most collegiate schools of nursing require that every student in the general nursing program complete 8 weeks of generalized field instruction in public health to qualify for the bachelor of science degree, whether the student intends to enter clinical nursing or public health nursing.

The most obvious solution to this problem is to increase the number of facilities. Philosophically, this is a sound objective, but, practically, there are many obstacles.

Since the primary function of public health agencies is to serve the public, only within the limits of their personnel and money can they

help in the education of undergraduate and graduate nurses. Voluntary agencies usually have less money and fewer personnel than they need for their immediate objectives. In addition, their decreasing caseload, which is a result of more and more patients being treated in outpatient departments instead of at home, makes for less diversity of case material. Official agencies, too, are usually hard pressed for sufficient money and personnel to perform the day-to-day activities prescribed by law.

Thus, it seems that any material increase in educational facilities must await additional funds from a population aroused to the need for such facilities. In the meantime, we must consider other possibilities for alleviating the shortage.

In Boston, Mass., we have explored the use of a specialized agency, the division of venereal diseases of the Massachusetts Department of Public Health, for generalized field instruction in public health for nurses. A specialized agency for generalized public health experience is an apparent contradiction in terms. However, our experiment suggests that a specialized agency can fulfill the requirements set down for generalized field instruction.

Events Leading to the Experiment

In the fall of 1948, the Boston College School of Nursing had a large number of graduate

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students who were planning to teach in schools of nursing after graduation. They had a broad clinical background, but they needed experience in a number of different fields of public health nursing, among them venereal disease control. Accordingly, arrangements were made with the division of venereal diseases in the Massachusetts Department of Public Health for a 1-week observation period.

The nurses were so enthusiastic about this experience that a careful study of their evaluation reports was made, followed by personal interviews. The students recommended that the period of field instruction be extended to allow them to participate actively in the division's program by doing contact interviewing and investigation. They reiterated that the 1-week observation period had been worth while for them both as nurses and as "people." Two of the nurses said that they had begun to see the venereal disease problem in a new light and felt sure that they would be better teachers for their experience.

In accordance with the requests from the students, the field instruction period was extended from 1 week to 2 weeks, and later to 4 weeks. A graduate of the Boston College School of Nursing, who majored in public health nursing, found the instruction comparable to that received in a generalized nursing agency. She recommended that the division of venereal diseases be considered as an agency for generalized public health nursing experience.

In view of the growing enrollment at the Boston College School of Nursing and the increasing difficulty of placement in the Greater Boston area, the school decided to explore the division of venereal diseases as a possible agency for an 8-week field instruction program. In the summer of 1952, Easter, a member of the school staff, worked in the division as a nurse epidemiologist, substituting for various members of the staff while they were on vacation. She was thus able to obtain firsthand information concerning the division's program, the qualifications of the supervisors and field personnel, and the type of experience a nursing student might expect to receive there.

This worker quickly became familiar with the basic pattern of the work of venereal dis-

ease nurse epidemiologists. She perceived that these specialized nurses interested themselves not only in the possible presence of venereal disease but also in its impact on the patient and his family, that they were concerned with discovering why patients became sexually promiscuous, why extramarital exposures took place, and kindred matters, and that through skillful inquiry they became familiar with other medical, social, and emotional problems in the family, some of them totally unrelated to the disease itself.

In short, the venereal disease nurse epidemiologists practiced generalized public health nursing, using the specific problem of venereal disease as their mode of approach to the family. This is not surprising when one realizes that the epidemiologist has had generalized public health training and experience before she specializes.

After 2 months' experience, the school staff member was convinced that the division of venereal diseases was a valuable source of experience in generalized public health. But would field instruction received in the division constitute the generalized educational experience required for university academic credit? This question needed careful and exact evaluation. Fortunately, criteria were available for measuring an agency's qualifications. These criteria fall into the following groups.

Qualified personnel: The students must receive field instruction under qualified public health nursing supervision in a public health agency which stresses family health. The field teachers, as well as the supervisors, must be adequately trained and qualified public health nurses.

Student experiences: The students must gain experience in family health teaching in the following areas: prenatal, postnatal, infant, preschool, school, adolescent, and adult health, geriatrics, chronic diseases, and rehabilitation.

Staff education: There must be a continuing and adequate program of staff education for the members of the public health agency.

Qualified Personnel

The division of venereal diseases, as one of the operating divisions of the Massachusetts Department of Public Health, is a State agency. It is charged by law with providing an adequate

program in the prevention and control of venereal diseases. It is also a medical care division in that it provides diagnostic and treatment services for those who have, or suspect they have, a venereal disease and are unable to afford private medical care.

The division has a statewide epidemiological service for the interviewing of patients and the followup of their contacts. Concerned with the field training program are the medical director, two public health nursing supervisors, and seven field instructors who are called nurse epidemiologists.

The director is a graduate of an approved school of medicine and the Harvard School of Public Health. He has had 6 years' experience in generalized public health as a district health officer and has specialized in the venereal diseases since 1947. He is a diplomate of the American Board of Preventive Medicine and Public Health and is a lecturer and staff member of the several medical schools and hospitals in Boston.

The two public health nursing supervisors have their certificates in public health. One has had 1 year of experience and the other 12 years with a visiting nurse association. They have had 14 and 17 years' experience, respectively, in the field of venereal diseases.

The field instructors have also had generalized training and experience before specializing. All of them have a certificate in public health nursing.

Experience in Family Health Teaching

The experience one gains from any teaching situation is a product of the interaction of a number of factors, including what the person brings into the situation from prior training and experience, the formal and informal instruction given by the agency, the facilities available, the supply of case material, the quality and quantity of supervision.

At conferences between the nursing school and division staffs, it was agreed that the minimal educational background and experience of a graduate nurse prior to her field instruction should be completion of all academic requirements of the baccalaureate curriculum for graduate nurses. As soon as the school knows what students are to be sent on field instruction,

copies of the students' educational achievement and experience are sent to the director of the division, together with the dates for their assignments.

Every graduate nursing student assigned to the division of venereal diseases receives the following instruction and experience over a period of 8 weeks:

1. Orientation on organization of the department of public health and the division of venereal diseases; the program of the division and how it is implemented; the division's relationship to other agencies. This is conducted by the medical director, the supervising public health nurses, and the senior clerical staff, on the first day of the nurse's assignment to the division and occupies 1 full day.

2. A 6-hour lecture course on the clinical and public health aspects of the venereal diseases. The clinical lectures are given by the medical director, and the public health lectures, by one of the nursing supervisors.

3. Demonstrations by the division director and by clinic physicians of active cases of gonorrhea and syphilis in State-cooperating venereal disease clinics.

4. Observation during the first 2 weeks of the principles and practices of contact interviewing and investigation. The student is assigned to observe in several districts, each district representing a different phase of the program.

5. Assignment of the student as assistant to a public health field nurse for the remaining 6 weeks. She is given cases to work up, including contacts, suspects, and lapsed cases. At first, the field nurse accompanies the student. Subsequently, 1 to 2 weeks later, the student is assigned to investigate cases by herself, but at the end of each day she reports to her field supervisor and discusses her cases with her. She also visits patients accompanied by the supervisor, who observes the following:

- Does the student establish rapport easily?
- Is the student aware of other problems the patient may have?
- What is the impact of this disease on the patient?
- What is the impact of this disease on the family?
- Are there any problems of the family which directly or indirectly contributed to the devel-

Reported venereal disease contacts and suspects in Boston, Mass., by age and marital status, 1955

| Age group | Single | Married | Widowed | Divorced | Separated | Not stated | Total |
|------------------|--------|---------|---------|----------|-----------|------------|-------|
| <i>Contacts</i> | | | | | | | |
| Under 1..... | 95 | 0 | 0 | 0 | 0 | 0 | 95 |
| 1-4..... | 20 | 0 | 0 | 0 | 0 | 0 | 20 |
| 5-9..... | 26 | 0 | 0 | 0 | 0 | 0 | 26 |
| 10-14..... | 20 | 0 | 0 | 0 | 0 | 0 | 20 |
| 15-19..... | 49 | 10 | 0 | 1 | 0 | 15 | 75 |
| 20-24..... | 139 | 69 | 1 | 8 | 22 | 94 | 333 |
| 25-29..... | 63 | 64 | 1 | 6 | 28 | 96 | 253 |
| 30-34..... | 20 | 46 | 1 | 7 | 20 | 67 | 161 |
| 35-39..... | 8 | 31 | 4 | 5 | 9 | 39 | 96 |
| 40-44..... | 1 | 16 | 0 | 4 | 9 | 17 | 47 |
| 45-49..... | 6 | 14 | 0 | 2 | 1 | 3 | 26 |
| 50-54..... | 3 | 9 | 1 | 1 | 1 | 4 | 19 |
| 55-59..... | 0 | 7 | 0 | 0 | 1 | 3 | 11 |
| 60-64..... | 0 | 6 | 0 | 0 | 0 | 0 | 6 |
| 65-69..... | 0 | 8 | 0 | 0 | 1 | 1 | 10 |
| 70 and over..... | 0 | 2 | 1 | 0 | 0 | 0 | 3 |
| Not stated..... | 9 | 40 | 0 | 4 | 2 | 40 | 95 |
| Total..... | 459 | 322 | 9 | 38 | 94 | 379 | 1,301 |
| <i>Suspects</i> | | | | | | | |
| Under 1..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-4..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5-9..... | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| 10-14..... | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| 15-19..... | 7 | 0 | 0 | 0 | 0 | 2 | 9 |
| 20-24..... | 13 | 14 | 1 | 0 | 2 | 11 | 41 |
| 25-29..... | 18 | 19 | 0 | 1 | 3 | 6 | 47 |
| 30-34..... | 12 | 24 | 0 | 1 | 10 | 7 | 54 |
| 35-39..... | 7 | 29 | 0 | 4 | 8 | 9 | 57 |
| 40-44..... | 3 | 20 | 5 | 4 | 3 | 11 | 46 |
| 45-49..... | 2 | 13 | 5 | 4 | 3 | 8 | 35 |
| 50-54..... | 4 | 19 | 2 | 1 | 6 | 7 | 40 |
| 55-59..... | 7 | 17 | 5 | 0 | 4 | 7 | 39 |
| 60-64..... | 6 | 19 | 3 | 2 | 4 | 3 | 37 |
| 65-69..... | 6 | 14 | 15 | 1 | 4 | 1 | 41 |
| 70 and over..... | 5 | 4 | 5 | 2 | 2 | 0 | 18 |
| Not stated..... | 0 | 5 | 0 | 0 | 0 | 10 | 15 |
| Total..... | 95 | 197 | 41 | 20 | 49 | 82 | 484 |

opment of venereal disease or sexual promiscuity; for example, divorce, separation, desertion, maladjusted marriage, illegitimacy, unfavorable environment?

- Are there other problems in the family not related to venereal disease? These may be medical, social, economic, moral, or environmental.

- Is the patient pregnant? If so, does the student inquire about prenatal care?

- Is the student aware of other agencies, and does she refer problems to them?

- Is she an effective teacher?

The system of instruction used by the division of venereal diseases has several advantages. First, one qualified field instructor is assigned to each student. Second, the student is pre-

pared for the actual "doing" experience by didactic and observational teaching. Third, there is an adequate caseload and a sufficiently varied group of patients for the students to gain experience in the areas enumerated above: this is apparent when one examines the amount and quality of the case material.

During 1955 a total of 1,785 contacts and suspects were investigated in Boston by the division of venereal diseases. These represent the potential family case studies made by the division staff. The distribution by age groups and marital status, shown in the table, indicates that the students had an opportunity for experience in the specific areas of family health mentioned.

During 1955, 16,986 visits for venereal dis-

ease were recorded in the Boston hospitals to which the graduate nurse students were assigned during their field training. This gave the students an opportunity to gain experience in contact interviewing and also the chance to see a number of varied types of clinical cases.

We conclude that the students had adequate field supervision and that they were exposed to a sufficient number and diversity of cases to give them experience in the specific areas of family casework listed above.

Staff Education

An interested and well-informed staff is basic to the success of any program. The division of venereal diseases, therefore, has a continuing educational program designed to meet the needs of the staff. Not only are the latest fruits from research laboratories reported, but the staff participates in the division's research projects.

Each member of the nursing staff has been sent to the Alto Medical Center in Georgia for intensive postgraduate training in contact interviewing. Furthermore, staff education meetings are held regularly each month from October through June.

At the education meetings, the staff nurses have an opportunity to hear guest lecturers preeminent in their fields, many of whom are from other States. For example, during the fiscal year 1955, our out-of-state guest speakers included Dr. Evan Thomas of New York and Dr. John Cutler of Washington, D. C. The former discussed immunity in syphilis, and the latter, the results of the long-term study of untreated syphilis. Another guest speaker was Dr. Roy E. Ritts, Jr., of the Peter Bent Brigham Hospital and Harvard Medical School, who spoke on present-day antibiotics and some of the new antibiotics under research study. Dr. John L. Fromer, chief of allergy and dermatology at the Lahey Clinic, discussed allergy in syphilis, thus bringing into clinical focus the discussions of Drs. Thomas and Ritts. At one meeting, a symposium on gonorrhea was held. The guest speakers were Dr. B. G. Clark, assistant professor of urology, and Dr. George W. Mitchell, professor of gynecology, at Tufts University School of Medicine. One

spoke on gonorrhea in the male, and the other, on gonorrhea in the female.

Principles of Supervision

During her field experience, the student becomes de facto a member of the venereal disease program staff and is subject to the rules and policies of the division. However, supervision of all workers, including the students, is based on democratic principles. The impact of this approach on the student may be deduced from the excerpts of students' evaluation of their field instruction.

"The entire situation was new to me, and I believe that this experience will broaden my narrow outlook on venereal disease and its effect upon family living. Most valuable to me was to observe workers functioning in a highly democratic atmosphere. I am more convinced than ever that this is the way an organization should be administered."

"This experience should be part of the education of every graduate nurse. What impressed me most of all was the sense of individual responsibility on the part of the epidemiologists. . . . They are presumed to be mature, reliable, professional people and are treated as such at all times."

While she is with the division of venereal diseases, the student nurse participates in the staff education program and in staff conferences. Individual conferences are held with the director, the supervisory nurses, and the field instructors. With the latter, they are held daily.

Once each week, the students return to the school for seminars with other nurse students who are affiliated with other agencies. A representative of the division of venereal diseases supervisory staff is present. The seminar is conducted by the faculty members, and the students are asked to relate their experiences and bring up cases for discussion. The entire group informally discusses the cases presented from the point of view of management, errors of omission or commission, the use of existing agencies, the current thinking in that area of public health, and the achievement of the objectives of family case work. In addition, the student is asked whether her own objectives of the field

experience have been attained and whether she has been forced to change her concepts of public health either by broadening them or making a radical readjustment.

Evaluation of the Students

Evaluation of the students' work is both objective and subjective. Fortunately, in venereal disease control there are objective yardsticks which measure the efficiency of a worker. These are the various indexes, such as the contact-patient index, the ratio of contacts discovered to contacts named, the epidemiological index, and the lesion-to-lesion index. These objective evaluations are applied to the student. The subjective evaluation is based on the reports of the field and central office supervisors. Every field supervisor is required to give a personal evaluation of the student every 2 weeks. A final written report on the student is submitted at the conclusion of the field instruction by the director of the division of venereal diseases.

The last phase of the evaluation is the student's opinion of the agency and the quality of instruction received. This evaluation may be best summed up in the words of the students themselves:

"This was by far the most interesting 8 weeks I have ever spent. It made me aware of the problems involved in cleaning out venereal disease from my city. I was also fortunate in that I had an opportunity to observe what these people are doing in the way of an inservice program in order to keep abreast of things in their own field. Then the same week we were able to observe the close association between the civilians and the armed services in an attempt to keep the venereal disease rate down. It is grati-

fying to see how much is actually being done that we never hear about. I think that the epidemiologists are the most interested of all public health nurses in the education of nurses."

"This field experience was very educational and interesting. The visits to the homes in the district were by far the most valuable to me, and I now wish that the training could have been longer. I regard this as one of my very best experiences even though I do not plan on public health nursing for a career. When taking care of hospitalized patients, I will have a better understanding of the patient, particularly from such an environment and with great emotional needs."

Summary

The shortage of adequate facilities for field instruction in public health led us to investigate the use of a specialized public health agency for generalized experience. On critical examination, the division of venereal diseases of the Massachusetts Department of Public Health was found to be a suitable organization for this purpose.

This agency has adequately trained and well-qualified personnel. It provides one qualified field supervisor for each graduate nurse student, a ratio which is seldom achieved in other agencies.

An adequate supply and a diversity of cases provide full opportunity for experience in family health teaching in the areas of prenatal and postnatal care, infant, preschool, school, adolescent, and adult health, geriatrics, chronic diseases, and rehabilitation.

The division of venereal diseases has a well-organized and effective staff education program in which the nursing students participate.

Applied Epidemiology of Gonorrhea in British Columbia

By A. JOHN NELSON, M.B., Ch.B., D.P.H.

MOST HEALTH JURISDICTIONS in North America have substantially reduced morbidity from venereal disease during the past decade. British Columbia has achieved these gains since 1946, when the Province entered the postwar era with the highest rates for gonorrhea and infectious syphilis of any Canadian Province. Since that date the infectious syphilis rate has declined markedly, but the successes achieved in gonorrhea control have been much less spectacular (table 1). Hence, gonorrhea must be considered the major venereal disease problem.

No true measure of the incidence and prevalence of gonorrhea exists. Reporting is notoriously incomplete, and figures based upon morbidity reports can be used only as a partial and minimum indication of both incidence and prevalence and, at most, to evaluate trends rather than to obtain the true picture of the gonorrhea problem.

Trends in morbidity reporting of gonorrhea from 1944 through 1955 for Canada and the continental United States are shown in figure 1. In both countries, following the peak incidence of 1946, case rates declined progressively until 1951; since then, the rates have remained virtually static. These trends may be compared with those for gonorrhea morbidity re-

porting in British Columbia and adjacent Provinces over the same period (fig. 2). British Columbia participated with other Provincial health jurisdictions in the general decline in gonorrhea incidence which followed the postwar peak of 1946.

The factors contributing to this general decline in gonorrhea incidence may be analogous to those described by Moore (1) in connection with the overall decline in the incidence of syphilis. However, it appears unlikely that the immediate postwar decline in gonorrhea was attributable to the application of control measures per se, a conclusion which is borne out by the subsequent stationary or rising trend in the incidence of gonorrhea in most areas.

In British Columbia the postwar decline in gonorrhea incidence ceased as early as 1948, and gonorrhea rates were more or less stationary through 1949 and 1950 (fig. 2), whereas in Canada and the continental United States the decline in gonorrhea incidence continued until 1951. It was concluded that, if further advances were to be made in the control of gonorrhea in British Columbia, the objectives and activities of the control organization would have to be reoriented and new approaches and answers to those apparently refractory problems which were hindering our efforts would have to be devised.

Since 1949, and at an accelerated pace since 1952, a series of studies designed to shed light upon the public health problem presented by gonorrhea and upon the reasons for the relative failure of the control program has been carried on. The objectives of the studies were the elucidation of basic epidemiological information

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Table 1. Number of new cases of venereal disease reported and rate per 100,000 population, British Columbia, 1944-55

| Year | Infectious syphilis | | Gonorrhea | |
|-----------|---------------------|-----------------------------|--------------|-----------------------------|
| | Number cases | Rate per 100,000 population | Number cases | Rate per 100,000 population |
| 1944----- | 380 | 40.8 | 3,358 | 360.3 |
| 1945----- | 615 | 68.0 | 3,711 | 391.0 |
| 1946----- | 834 | 83.2 | 4,618 | 460.4 |
| 1947----- | 575 | 55.1 | 4,056 | 388.6 |
| 1948----- | 239 | 22.1 | 3,608 | 333.5 |
| 1949----- | 139 | 12.5 | 3,691 | 331.6 |
| 1950----- | 61 | 5.4 | 3,627 | 319.0 |
| 1951----- | 36 | 3.1 | 3,336 | 286.4 |
| 1952----- | 33 | 2.7 | 3,098 | 258.6 |
| 1953----- | 26 | 2.1 | 2,968 | 241.3 |
| 1954----- | 17 | 1.3 | 2,668 | 210.7 |
| 1955----- | 14 | 1.1 | 2,494 | 191.1 |

SOURCE: Notification of Venereal Infection, form N.H.I., Department of National Health and Welfare, Canada.

regarding this infection and the development of control measures based upon applied epidemiology. The purpose of the present paper is to report upon what has been achieved to date.

Contact Tracing

Comparison of the relative advantages and disadvantages of the three major case-finding activities—education, screening of selected groups, and contact tracing—suggested that effective contact tracing offered the greatest possibilities for a focal attack upon the gonorrhea problem. By this time, the hope that penicillin therapy was so highly specific for gonococcal infection that it was sufficient to treat only known cases and that, with the onset of symptoms, contacts could be relied on to seek medical care had been disproved. Therefore, in 1949 it was decided to develop and improve contact tracing as the strategic epidemiological weapon against gonorrhea.

Prior to 1949, contact tracing had been pushed to the utmost against syphilis, which was considered to be the more serious venereal disease, whereas contact tracing against gonorrhea, although included in the case-finding program, had been haphazard and unorganized. Thus, followup of readily identifiable contacts

of gonorrhea cases reported by venereal disease clinics was pushed. Rather less effort was made to ascertain and follow up the contacts of cases reported by private physicians. Little was done to identify the reservoir of infection responsible for perpetuating the disease, and the efficiency and achievement trends of contact tracing were not quantitatively assayed.

From 1949 on, all patients seen at venereal disease clinics were interviewed for contacts. Since many gonorrhea patients were first diagnosed by private physicians, who gave inadequate or no contact information on their morbidity reports, all Provincial health units and other health agencies working in close contact with local private physicians were instructed that every gonorrhea morbidity report, "prior to submission to the division of venereal disease control, should be scrutinized for contact information. Where the attending physician fails to list a minimum of one contact per notified case, the health unit should take steps to see that he is made aware of the importance of his contribution to the overall control program. The modus operandi here should be for the health unit to make an offer of aid (in the elicitation and followup of contacts) so convincingly extended and so helpfully applied as to earn willing acceptance."

Gonorrhea contact indexes (per 100 reported cases) were maintained in order that contact tracing might be quantitated to determine its efficiency and to permit comparative evaluation

Figure 1. Number of gonorrhea cases per 100,000 population, Canada and the United States, 1944-55.

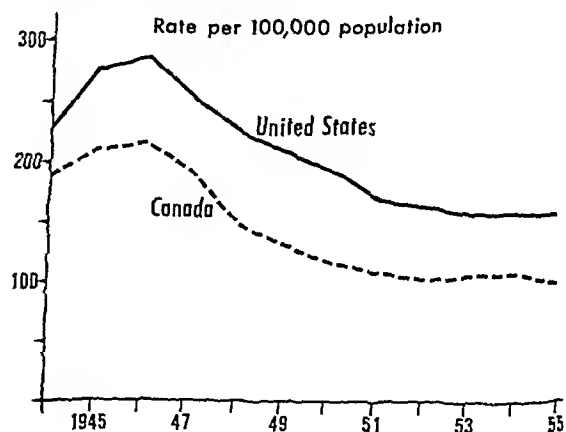
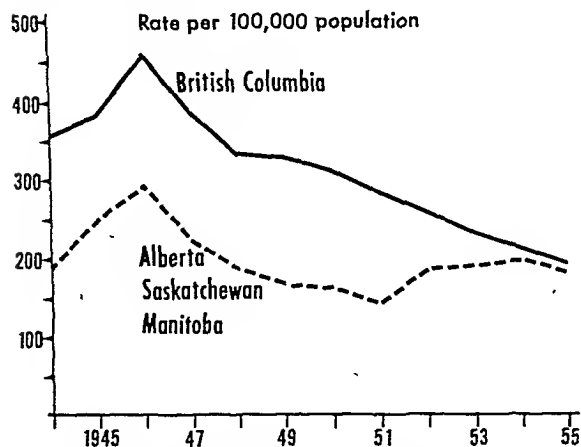


Figure 2. Number of gonorrhea cases per 100,000 population in British Columbia and in Alberta, Saskatchewan, and Manitoba, Canada, 1944-55.



of the contributions made to the program by private physicians and trained epidemiological workers from the venereal disease clinics. Critical reevaluation of the epidemiological data for 1949-53 reveals that these measures, undertaken as part of the intensive contact tracing program, were moderately successful.

Epidemiological Studies

Epidemiological studies made in 1952 and 1953 were perhaps the most important contribution to our understanding of the epidemiology of gonorrhea and were the determining factor in the introduction of selective contact tracing. These studies (2) brought out that:

1. One venereal disease patient in every three becomes a repeater.

2. There is an important sex differential in gonorrhea reporting. In 1944-52 the male to female ratio was 2.50 (table 2). This suggests the existence of a reservoir of infected and undiagnosed females and points to the necessity for increased case-finding efforts among women. In 1952, 12.7 percent of all women examined at the Vancouver Gaeol Examination Centre had untreated gonorrhea.

3. A successful epidemiological attack upon gonorrhea involves recognition of the fact that the reservoir of infection is made up of female patients, most of whom are unidentified, and that the objective of epidemiology is to bring

the infected woman to treatment before she can infect a third person. This means that the female with undiagnosed gonorrhea must be identified through her recent male contact and be brought to treatment within hours.

A focal attack upon this reservoir of gonorrhea was incorporated in a four-point "speed-zone" project instituted by the division of venereal disease control in August 1953. The objectives of this project were:

1. To interview all male gonorrhea patients for information regarding their female contacts during the 6-day period preceding onset of symptoms. It was believed that the male patient could be used as a signpost leading to an infected female contact or to a potential carrier. Efforts were concentrated upon female contacts of known infected males in the belief that infected male contacts of known infected females would come to treatment voluntarily.

2. To locate identifiable female contacts within a matter of hours in order to minimize numerical opportunities for dissemination of infection.

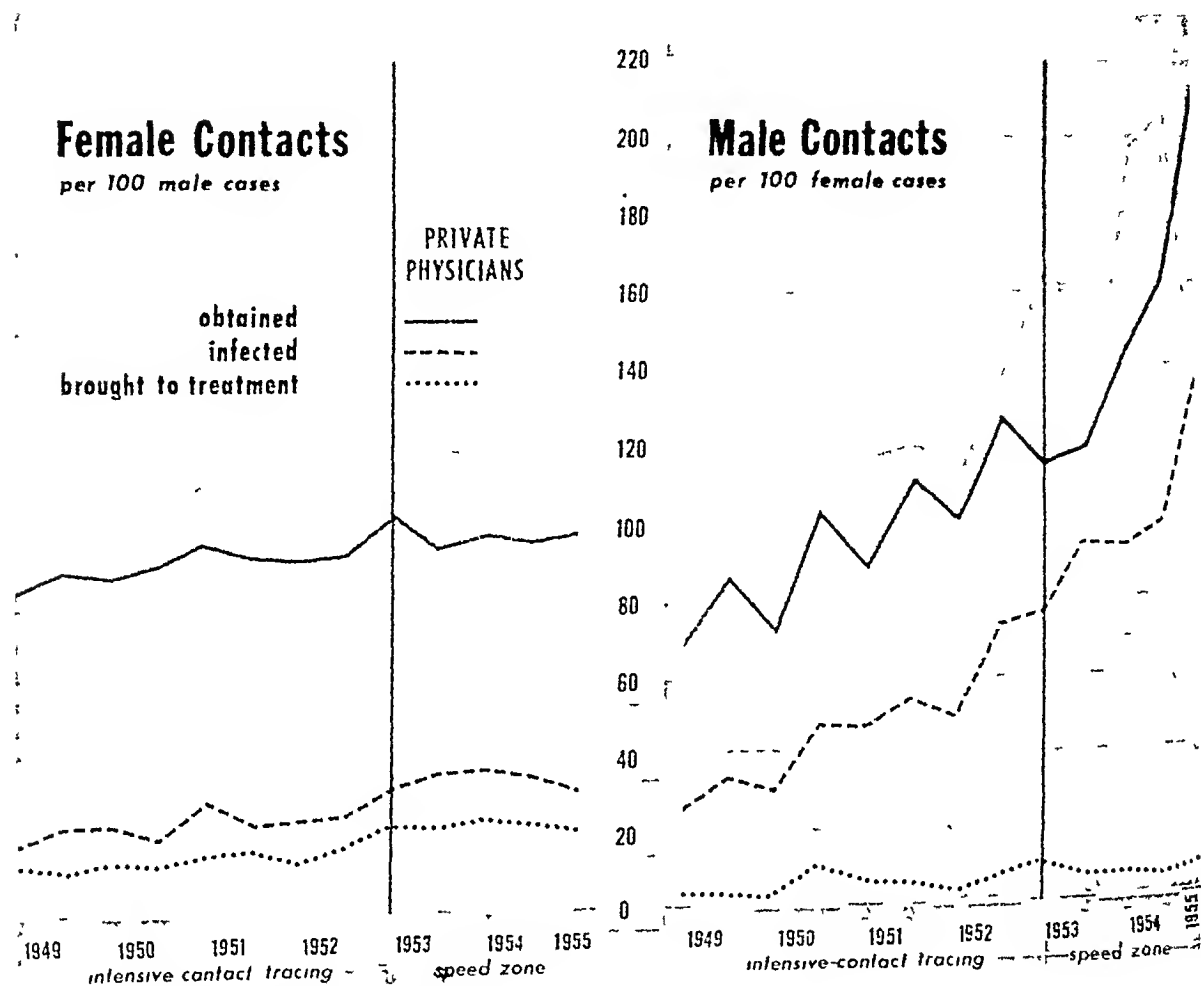
3. To treat female contacts immediately as suspect carriers, although, when practicable, urethral and cervical smears and cultures were to be taken before treatment. This procedure appeared justifiable because it is difficult at any time to make a bacteriological diagnosis of gonorrhea in women and even more difficult to

Table 2. New cases of gonorrhea reported, by sex, British Columbia, 1944-52

| Year | Number of cases | | | Male/female ratio |
|------------|-----------------|--------|--------|-------------------|
| | Total | Male | Female | |
| 1944----- | 3,358 | 2,460 | 898 | 2.74 |
| 1945----- | 3,711 | 2,682 | 1,029 | 2.61 |
| 1946----- | 4,618 | 3,244 | 1,374 | 2.36 |
| 1947----- | 4,056 | 2,925 | 1,131 | 2.59 |
| 1948----- | 3,608 | 2,575 | 1,033 | 2.49 |
| 1949----- | 3,694 | 2,513 | 1,181 | 2.13 |
| 1950----- | 3,627 | 2,428 | 1,199 | 2.03 |
| 1951----- | 3,336 | 2,461 | 875 | 2.81 |
| 1952----- | 3,098 | 2,352 | 746 | 3.15 |
| Total----- | 33,106 | 23,640 | 9,466 | 2.50 |

SOURCE: Notification of Venereal Infection, form N.H.I., Department of National Health and Welfare, Canada.

Figure 3. Semiannual gonorrhea contact, epidemiological, and brought-to-treatment indexes, by sex, British Columbia, 1949-55.



determine that a given woman is free of infection.

4. To control community conditions facilitating the acquisition and spread of venereal disease, which was considered to be just as important in an epidemiological program of this nature as it was formerly.

Evaluation techniques were devised by developing achievement indexes, to determine whether the first two objectives were being met.

Since interviewing male patients for information regarding their significant female contacts is the crux of selective contact tracing, the contact, epidemiological, and brought-to-treatment indexes of Iskrent and Kahn (3) were used, on a semiannual sex-specific basis, for evaluation of gonorrhea contact tracing. More specifically, the sex-specific brought-to-treat-

ment index obtained from the followup of female contacts of male patients was regarded as the critical index of achievement in selective contact tracing.

Because the value of specialized contact investigation would probably be in direct proportion to the length of time by which the infectious period was shortened, followup studies were instituted to measure the elapsed time between naming of contacts and date of treatment of such contacts.

By using these techniques, the achievements of gonorrhea contact tracing during both the 5-year intensive contact-tracing period (January 1, 1949, through June 30, 1953) and the 3-year speed-zone period (July 1, 1953, through June 30, 1955) could be evaluated and contributions to the program by private physicians and

by trained epidemiological workers from the venereal disease clinics could be compared (fig. 3). In the material which follows, all achievement indexes are based upon 100 reported cases of gonorrhea in either sex. For example, the contact indexes for males measure the number of female contacts obtained by interviewing 100 male gonorrhea patients.

Although field investigation of male contacts to female gonorrhea patients was not considered worth while because of the belief that infected male contacts would come to treatment of their own accord, it was felt that useful information could be obtained by matching records. The semianual achievement indexes in the right-hand column of figure 3 indicate that most infected male contacts come to treatment voluntarily and that, as measured by the brought-to-treatment indexes, contact tracing, per se, is not and never has been a productive method of finding cases of gonorrhea in males.

A progressive and marked increase in the female contact index obtained by private physicians occurred during both the intensive contact-tracing and the speed-zone periods. Private physicians are in a position to obtain information from females regarding their male contacts. Although this information will not increase the discovery of new cases of gonorrhea in males, it may be assumed that private physicians could effect a like improvement in the male contact index by questioning male patients regarding their female contacts.

The critical indexes are those which measure the results of investigation of female contacts of male patients and should reflect both effort and achievement in reducing the reservoir of gonorrhea infection among females. The data in the left-hand column of figure 3 indicate that, over the entire period 1949-55, clinic epidemiological workers increased their contact index for males from 99 to 143. Private physicians improved their contact index from 84 to 103 during the intensive contact-tracing period but were unable to effect any further improvement and have not been able to maintain this critical index above 100 (1 female contact per reported male patient).

Similar trends are apparent in the corresponding epidemiological indexes. Clinic workers increased their epidemiological index

for males from 37 to 44 (19 percent) during the intensive contact-tracing period and, with the advent of selective contact tracing, further improved this index to a high of 69 (57 percent). The trend of the epidemiological index for private physicians followed the trend of their contact index, an early and marked increase in the epidemiological index from 19 to 33 (74 percent) during the intensive contact-tracing period being followed by a more or less stationary trend.

Results

In terms of ultimate achievement, as measured by the male brought-to-treatment indexes, during the intensive contact-tracing period the clinic epidemiologists almost doubled the number of new cases of gonorrhea discovered in females as compared with the number discovered during early 1949 and subsequently trebled this number in the speed-zone period. The pattern of the brought-to-treatment index for private physicians approximates the pattern of their contact and epidemiological indexes, with an increased yield of new cases among females during the intensive contact-tracing period followed by a period during which no further improvement was made.

Table 3. Cumulative percentage distribution of new cases of gonorrhea among females brought to treatment through contact investigation, according to time taken to bring under treatment by clinics of the division of venereal disease control, British Columbia, July 1, 1952-December 31, 1954

| Time between being named as contact and treatment (days) | Control period | | Speed-zone period | |
|--|-----------------|-----------------------|-------------------|-----------------------|
| | Number of cases | Cumulative percentage | Number of cases | Cumulative percentage |
| Less than: | | | | |
| 1----- | 10 | 3.73 | 38 | 8.30 |
| 2----- | 27 | 10.07 | 86 | 18.78 |
| 4----- | 52 | 19.40 | 140 | 30.57 |
| 8----- | 95 | 35.45 | 225 | 49.13 |
| 15----- | 145 | 54.11 | 311 | 67.91 |
| 31----- | 207 | 77.24 | 385 | 84.07 |
| 91----- | 249 | 92.91 | 418 | 93.82 |
| 365----- | 268 | 100.00 | 458 | 100.00 |

Table 4. Number of new cases of gonorrhea among females brought to treatment through contact investigation, according to time taken to bring under treatment by clinics of the division of venereal disease control, British Columbia, July 1, 1952–December 31, 1954

| Time between being named as contact and treatment (days) | Number of cases brought to treatment | | |
|--|--------------------------------------|-------------------|-------|
| | Control period | Speed zone period | Total |
| Less than 1..... | 10 | 38 | 48 |
| 1..... | 17 | 48 | 65 |
| 2-3..... | 25 | 54 | 79 |
| 4 or more..... | 216 | 318 | 531 |
| Total..... | 268 | 458 | 726 |

By means of these sex-specific contact, epidemiological, and brought-to-treatment indexes, it has been possible to analyze in some detail our data for the period 1949–55 and to demonstrate improvement in the accomplishments of contact investigation in gonorrhea control. However, there is considerable room for improvement in the contributions which might be made by both clinic epidemiologists and private physicians in particular toward the whole program.

Contact investigation in gonorrhea control is not being exploited to the utmost unless and until private physicians (*a*) are thoroughly indoctrinated with the potential importance of their contribution to contact tracing, (*b*) are made aware of the importance of the undiagnosed reservoir of gonorrhea in females, and (*c*) acquire new attitudes and skills in interviewing male gonorrhea patients for female contacts. The increasing importance of the private physician's role in gonorrhea control is also evident from the fact that whereas in 1949 private physicians submitted 36.6 percent, clinics, 60.6 percent, and other agencies, 2.8 percent of all morbidity reports, by 1955 these figures were 45.2 percent, 35.5 percent, and 19.3 percent, respectively.

It is important to locate all female contacts within a matter of hours of identification in order to minimize numerical opportunities for dissemination of infection. Therefore, it is use-

ful to know not only the contact index but also the elapsed time between the identification of the female contact and her examination and treatment. Indeed, the success or failure of the speed-zone project must be gauged by the rapidity with which infected females are brought to treatment, thus shortening the infectious period.

In order to determine whether a significantly larger number of infected female contacts were brought to treatment earlier by speed-zone techniques than by conventional contact tracing, a special study was made on clinic patients only. The numbers of new cases of gonorrhea in females brought to treatment through contact investigation during the 13 months July 1, 1952, through July 31, 1953, the latter part of the intensive contact tracing period, with the time lapse in days between identification as a contact and treatment, were compared with the numbers brought to treatment during the 17 months August 1, 1953, through December 31, 1954, the early part of the speed-zone period. The relevant data are given in tables 3 and 4.

During the speed-zone period, approximately 19 percent of all females brought to treatment were treated within 48 hours after they were named as contacts; 30 percent were treated within 4 days; and 84 percent within 1 month (table 3). The corresponding figures for the control period were 10 percent, 19 percent, and 77 percent, respectively. Statistical treatment of the data in table 4 indicates that introduction of speed-zone epidemiological techniques into the clinics of the division of venereal disease control in British Columbia was effective in significantly reducing the time between being named as a contact and treatment of female gonorrhea patients brought to treatment through contact investigation. This, in the final analysis, decreased the chances of the promiscuous male population acquiring gonorrheal infection.

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how are we doing in public health?

Today, the growth and movement of population add to the complexity and multiplicity of problems of public health, with a future expectation of 200 million persons in the United States. In great unserved areas some 40 million people live, while others are not served too satisfactorily in additional geographic areas of this country. We cannot close our eyes to the impact of other changes. Close to a third of the Nation's families changed addresses in a recent 3-year period; 10 million families moved to another State; there is a tendency toward early marriage . . . thousands of women confront a prospect of 8 to 9 years of widowhood; urbanization is accompanied by a lessening of effective relationships among individuals . . . population growth has outstripped the increase in professional public health workers.

IRA V. HISCOCK, Sc.D.

President, American Public Health Association, 1955-1956
From the presidential address at the
Eighty-fourth annual meeting, November 13, 1956

**SUMMARIES OF SELECTED PAPERS
from the 84th annual meeting
of the
AMERICAN PUBLIC HEALTH ASSOCIATION
and related organizations
held at Atlantic City, N. J.
November 12-16, 1956**

The APHA Conference Report



With the assistance and cooperation of the authors, the staff of *Public Health Reports* has summarized some 70 of the papers presented at the 81th annual meeting of the American Public Health Association and related organizations in Atlantic City.

Summaries selected for publication in the following pages are intended to present information which may not otherwise have been given adequate notice. Omitted from these selections are papers which were known to have been scheduled for early publication in the *American Journal of Public Health*; papers

whose authors provided no copies for this journal; and papers which, for one reason or another, did not seem suited to summarization.

No papers on laboratory methods are summarized here because of the understanding that they would have early publication, at least in brief form, in the *APHA Journal*.

Other papers presented at the conference are under consideration for publication in subsequent issues of *Public Health Reports*.

Names of sections and affiliated organizations which sponsored papers presented at the conference are listed below.

Sections of the American Public Health Association

Dental Health
Engineering and Sanitation
Epidemiology
Food and Nutrition
Health Officers

Laboratory
Maternal and Child Health
Medical Care
Mental Health

Occupational Health
Public Health Education
Public Health Nursing
School Health
Statistics

Related Organizations Participating in the Conference

Associations

American Association of Public Health Physicians
American Association of Registration Executives
American Psychiatric Association
American School Health Association
Association of Business Management in Public Health
Association of Labor Health Administrators
Association of Schools of Public Health

Association of State Maternal and Child Health and Crippled Children's Directors
National Tuberculosis Association
Public Health Cancer Association

Conferences

Directors of Public Health Laboratories
Health Council Work
Medical Care Teaching
Municipal Public Health Engineers
Nurse Directors
Public Health Veterinarians

State and Provincial Public Health Laboratory Directors

Other

American College of Preventive Medicine
Laboratory Problems Related to Health
Military Government-Civil Affairs
Public Health Society
National Citizens Committee for the World Health Organization
National Sanitation Foundation
Nurse Mental Health Consultants
State Sanitary Engineers

Nutrition . . .

Sitosterol in Corn Oil, A Cholesterol Depressant

A recent experiment suggests that the presence of sitosterol in corn oil is at least in part responsible for the depressant effect of this fat on plasma cholesterol, reported Dr. J. M. R. Beveridge, in a review of his own work and that of other investigators on fat metabolism. Dr. Beveridge is at Queens University, Kingston, Ont., Canada.

His research relates to the established association between high plasma lipid levels and a high incidence of atherosclerosis. Whether or not the relationship is one of cause and effect is not yet known, Beveridge pointed out. However, he considers it justifiable, and indeed advisable, "to regard high plasma lipid concentrations as a factor that potentiates the development of atherosclerosis in humans." Diet, of all the factors that affect the concentration of cholesterol in the blood, is undoubtedly the most important, he said.

In this experiment, 52 healthy young male subjects ingested a diet high in butterfat for an initial 8-day period. Then they were divided into five groups, one of which received beta-sitosterol as a supplement. Two groups received alpha-tocopherol in differing amounts; one was transferred to a diet high in corn oil; and another was continued on the butterfat diet.

The group on the sitosterol and the one on the corn-oil diet showed a highly significant decrease in plasma cholesterol, Beveridge stated. The decrease for the former was 21.2 percent; for the latter, 23.1 percent. The alpha-tocopherol, however, had no effect, he added.

One possible reason for this unexpected result with sitosterol, he claimed, is that it was distributed uniformly throughout the formula-type ration, in contrast with the usual procedure of giving it in the

form of a suspension before, during, or just after meals.

A number of investigators had shown that beta-sitosterol brings about a cholesterol decrease in some hypercholesterolemia individuals, Beveridge remarked, but it had not been found to be effective for persons with plasma cholesterol concentrations of less than 200 mg. per 100 ml. plasma.

Animal and Vegetable Fat

Earlier experiments, according to Beveridge, demonstrated that animal fat in the diet actively raises plasma cholesterol levels and that vegetable fat (corn oil) actively lowers the levels.

In all his experiments, he used "homogeneous diets comprised of a relatively few components of definitely known composition that could be accurately made up and dispensed." This regimen, he maintained, permitted "excellent control over calorie intake and complete control over the proportion of calories derived from the main components of the diet and also regulated the mineral and vitamin intake."

The initial experiments with this regimen showed (1) that dietary cholesterol in amounts up to about 700 mg. per day had no effect on the concentration of plasma cholesterol and (2) that corn oil in the diet resulted in significantly lower plasma lipid levels than did equi-calorie amounts of butter fat.

A subsequent experiment attested to the "presence of a factor in corn oil that actively lowers plasma cholesterol levels," Beveridge stated. After a fat-free diet for 8 days, subjects were placed on a corn-oil diet for another 8 days. After the first 8 days, the plasma cholesterol level had decreased an average of 22.2 percent; after the second 8 days, it had decreased an additional 15.2 percent.

The most recent experiments have investigated the nature of the cholesterol depressant and elevating fac-

The 9 charts on the following pages are taken from recent publications issued in limited editions by the Division of Public Health Methods, Public Health Service: a chart book on health status and health manpower, issued February 1956; and a chart book on health service manpower prepared for the October 24, 1956, meeting of the National Advisory Health Council. The latter has been reissued as PHS Publication No. 511.

tors. There appear to be two factors in butterfat that tend to elevate plasma cholesterol levels, Beveridge said, one in the first fraction, presumably due to the nature of the unsaponifiable fraction or the short-chain fatty acids, and the other in all fractions.

Sees Future for Antibiotics As Food Preservative

Assets and limitations of antibiotics in preserving food were surveyed by Dr. F. E. Deatherage, professor of agricultural biochemistry, Ohio State University.

He reported that certain of the broad spectrum antibiotics have shown great potential value in delaying the spoilage of perishable fresh food, and in proper usage there appears to be no public health hazard. But he emphasized that each application must be studied individually. Not all antibiotics act the same way nor do all foods spoil the same way.

While the tetracyclines, particularly chlortetracycline, may be effective in preserving meat, penicillin is worse than nothing, for it promotes a rapid development of the normal spoilage flora, Deatherage explained. Streptomycin is of no value in preserving the high protein foods, yet it is quite effective for bacterial soft rot of certain fresh vege-

tables. All of these antibacterial agents are useless against fungal spoilage of many fruits and vegetables.

Many new and striking developments in antifungal agents are on the horizon, he said. Control of brown rot in peaches has been demonstrated. Griseofulvin and other unnamed antifungal agents show much promise in controlling phytopathogenic fungi as well as yeasts and molds which cause deterioration in many foods.

Complements Refrigeration

Antibiotics do not sterilize food, Deatherage pointed out, but, like refrigeration, they may inhibit the growth of bacteria already there. Both are most effective in controlling spoilage when the food is handled in the most sanitary manner. Neither can be used to upgrade a spoiled or inferior product. Antibiotics and refrigeration are complementary. Both can do more than either alone in controlling spoilage. But each can produce its effect without the other.

Summing up the effect of chlorotetracycline, Deatherage reported that infusion of whole or half carcasses of beef results in a keeping time of at least 72 hours, even when the internal temperature of the meat remains in the 70-85° F. range. It greatly retards slime formation and surface spoilage in the carcass, cut, or ground forms of meat, although the length of holding time depends on the temperature and original bacterial load. For ground beef originally containing 200,000 organisms per gram, 2 p.p.m. of chlorotetracycline will increase the usable life at 10° C. from 2 to as much as 9 or more days. The same holds true for pork sausage. Generally, the use of an effective antibiotic on a perishable food, such as poultry, milk, and eggs, will increase the usable life 2 to 3 times.

Although antibiotics do not offer permanent preservation, Deatherage said, their addition to refrigerated shipments in this country can reduce the waste in meat caused by tem-

perature fluctuations in transit from packer to distributor and retailer.

In countries where perishable foods are not distributed under refrigeration, antibiotics will afford a few days of keeping time for fish, milk, poultry, and meat without the high capital outlay for equipment. This would mean more meat for more people in places where animals must be brought to the point of consumption and slaughtered and eaten the same day.

Deatherage concluded that the use of antibiotics in food is a relatively new facet of an old concept: man's use of nature's biological controls for his own advantage. Control of one organism, either microscopic or macroscopic, by another through chemical means is widespread throughout nature.

Puerto Rican Health Group Improves Island's Nutrition

The Puerto Rican Nutrition Committee has done much to alleviate borderline nutritional deficiencies in Puerto Rico, said Marta Coll-Camalez, U. S. Department of Agriculture, Caribbean Area Office, San Juan, Puerto Rico.

Faulty food habits and low income are two of the main factors responsible for Puerto Rico's nutritional deficiencies, she stated. The typical diet is low in high quality protein, vitamin A, and calcium.

The committee attempts, through its education programs, and with the help and cooperation of government agencies, to improve food habits without changing the basic structure of the dietary pattern and to increase the per capita income through social and economic programs.

In the last few years, the committee's activities have made the use of enriched flour and enriched rice compulsory throughout the island. It has developed a "basic four" chart instead of the "basic seven" and has campaigned for the consumption of nonfat dry milk solids among the low-income group that cannot afford to buy whole milk.

Other educational programs include a film strip and a movie about milk and its importance in the diet and a film strip on calabaza (squash).

Campaigns are under way to fight misleading advertising concerning the nutritional value of certain products widely sold in the island, to discourage the adding of vitamin D to fresh milk, and to discourage importers of milk from using vitamin D as a selling point.

The committee is also studying diets served at government institutions. Recommendations will be made to correct deficiencies that are found.

Social Science Offers Key To Folkway Food Barriers

Collaboration between social scientists and health workers in nutrition programs was advocated by John Cassel of the School of Public Health, University of North Carolina.

Food habits are among the oldest and most deeply entrenched aspects of many cultures and cannot be easily changed or, if changed, can produce a further series of unexpected and often unwelcome reactions, Cassel said.

Before attempting to introduce innovations into an area, health workers must first know intimately and in detail the people's beliefs, attitudes, knowledge, and behavior. Second, they must determine the pattern or system into which these customs or beliefs fit.

Here, Cassel said, are contributions social scientists can make to health programs, particularly in helping determine why certain practices obtain, in predicting the difficulty in changing them, and in indicating the most helpful techniques.

Social scientists can also assist in defining subcultural groups within an area, he stated. In southern Illinois, for instance, social scientists have distinguished eight separate subcultural groups, each with their own set of attitudes toward food

and none of them based on knowledge of or interest in nutritional values. He termed concentration of the nutritionist's time on specific groups more efficient than a broad areawide program.

Zulu Food Pattern

To illustrate the relevance of social and cultural factors to health programs, Cassel related the experience over 12 years of the Polela Health Center in introducing green vegetables, eggs, and milk into the food pattern of a Zulu community in the Union of South Africa.

In 1940 the existing diet consisted mainly of a single staple, corn, a large percentage of it refined cornmeal purchased with money sent home by migrant laborers. Supplementary foods were dried beans, negligible amounts of milk, meat, and wild greens, and potatoes and pumpkins in season.

Eighty percent of the people exhibited marked stigmata of malnutrition. Pellagra and kwashiorkor were common.

The first task was the refutation of the commonly held belief of the people that this diet was the diet of their ancestors. "Had not their ancestors been strong and healthy, mighty men of valor and military deeds?"

When the health educators, all of them Bantu speaking the Zulu language, assisted groups in realizing that much of their present diet was not so traditional as they had previously maintained, the older people, with their roseate views of the "good old days," frequently led the groups in condemning the modern inferior diet.

No deep-seated symbolic values were associated with green vegetables and eggs, and their introduction mainly hinged on arduous education and demonstration. The people had enjoyed the wild greens which soil erosion had depleted. They were shown how vegetables could be cultivated in gardens. The answer to the commonly held attitude that it was uneconomical and

greedy to eat an egg which would later hatch into a chicken was improvement in the yield to provide enough eggs for both eating and breeding.

The Milk Barrier

Milk was associated with deeply rooted beliefs and customs, however, and increasing the consumption proved most difficult and complex.

Only members of the kin group of the head of a household could use milk produced by that man's cattle. His wife was excluded because she did not belong to her husband's kin group. Milk was also usually excluded from the diet of girls after puberty. During her menses or when pregnant, a woman was thought to exert an evil influence on cattle.

To these people anything that might have an evil influence on the cattle would affect the relationship between a man and his ancestors, on whose goodwill he depended for protection against misfortune and ill health.

Stressing the importance of milk as an ideal food for lactating or expectant mothers was to no avail. Analysis of the underlying beliefs indicated clearly that the barrier to greater milk consumption lay in the link between milk and the specific cattle it came from. Powdered milk was the solution. It came from cows which did not belong to any member of the tribe or any other related groups.

In addition to applying social science concepts, Cassel cautioned nutritionists against the tendency to be "culture bound." Too often, he said, food patterns which differ from the nutritionist's familiar and customary experiences are automatically labeled "bad." Attitudes and beliefs which differ from their own are regarded as illogical, misinformed, or wrong.

Current nutritional theory is based largely on animal experimentation and work with people living in a particular cultural milieu, chiefly Western culture, he pointed

out. We have little evidence to indicate that all of this theory is applicable to all people irrespective of their way of life.

Vegetable Mixes Offer Adequate Basic Diet

Vegetable mixes as the basic diet may be the most economical solution to protein malnutrition in countries with an inadequate supply of meat, according to Dr. James B. Allison of Rutgers University.

He reported that an agricultural economy designed to provide a mixture of vegetable proteins with a relatively high nutritive value is now being studied by the Institute of Nutrition of Central America and Panama, under the direction of Dr. Nevin Scrimshaw, in cooperation with agricultural agencies of member countries.

Figuring in this system is the production of enough animal products to insure good supplementation with the essential nutrients provided by milk, eggs, fish meal, and meat.

The deficient patterns of various foods, Allison explained, can be corrected in whole or in part by mutual supplementation, a corrective process that is adequate in the average mixed diet in the United States.

Addition of soybean meal to cornmeal, for example, helps correct deficiencies of the amino acids lysine and tryptophan in cornmeal. Sesame seed will improve the sulfur amino acids and increase the tryptophan further. A mixture of whole wheat and milk develops a pattern of amino acids of high nutritive value. People themselves have learned to a certain extent to supplement deficient plant food, as in suetash, he said.

Allison described the structure and functions of dietary proteins and discussed some of the newest concepts of protein synthesis. In brief, the dietary proteins supply amino acids for cellular protein synthesis and for other special metabolic purposes. Forming the pro-

tein compound are some 22 different amino acids arranged in order along a polypeptide chain.

It has been found that not all of the 22 amino acids need to be supplied by the diet although they are all required by the body, and their inclusion in the diet may relieve the body of the stresses of synthesis.

The amino acid glycine, for example, can supply the material for synthesis of all but eight in sufficient quantities to maintain nitrogen equilibrium in adult man.

The eight amino acids essential for maintenance of nitrogen equilibrium in man are isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Possibly arginine and histidine should be added for the growth of the infant.

But in the complex story of protein synthesis the pattern of protein intake is also important. The essential amino acids must be arranged in their proper places on the protein catalyst. If any acid is missing, a break in the chain occurs and celin-

lar protein cannot be formed. A low concentration of an essential amino acid also limits synthesis.

Increased intake of a food deficient in essential amino acids, such as wheat gluten, can help correct the deficiency, but too great an increase of the deficient food may result in an excess of the other amino acids and excretion of waste nitrogen. It may also create an imbalance between nitrogen and calorie intakes, a type of imbalance commonly found in many areas of the world where low protein, high carbohydrate foods are basic to the diet.

If the dietary protein supplies the essential amino acids in a pattern appropriate for synthesis and other needs of the body, the intake can be relatively low, Allison said.

He cited the need for analyzing the dietary protein sources of the world to determine the amino acid patterns available to various peoples and for determining the ideal dietary pattern for use in evaluating these protein sources.

The present study confirmed the fact that older women are more prone to bear mongoloid children than younger women, a fact that implies that chronic, rather than acute, processes may be causative factors, Ingalls declared. Moreover, he said, a definite excess of chronic conditions, especially among the older mothers, was found in the mothers of mongoloid babies as compared with their controls.

Another finding of significance, according to the report, was that the mothers of mongoloid babies, both the younger and the older ones, had had more miscarriages or stillbirths than their controls.

On the basis of this study and others, Ingalls concluded that "mongolism has a multiple etiology from nonspecific acute and chronic stresses that are additive and active in the first trimester of pregnancy."

Indicates Way to Control Nursery Outbreaks

Since 1954, there has been a rising incidence of epidemics of staphylococcal infections among the newborn in hospital nurseries, caused by a penicillin-resistant strain of *Staphylococcus pyogenes*, according to a study conducted at the Ohio State University.

Reporting the following findings on 19 outbreaks in United States nurseries were Drs. Thomas E. Shaffer, Robert F. Sylvester, Jr., Jack N. Baldwin, and Melvin S. Rheins.

In identifying the epidemic strain, bacteriophage typing and determining the pattern of antibiotic sensitivity proved to be valuable techniques.

The principal manifestation of infection was the pustular skin lesion among infants. Breast abscesses among nursing mothers, and in some cases among the infants themselves, were observed. Fatal infections have been reported.

Nasal carriage of the virulent strain preceded clinical infection.

Maternal and Child Health . . .

Factors Causing Mongolism Differ With Maternal Age

The factors causing mongolism in the progeny of older women are quite different from the factors productive of the disease in the offspring of younger women, stated Drs. Theodore H. Ingalls, Joan G. Babbott, and F. Randolph Philbrook, Harvard University School of Public Health.

They drew this conclusion from their study of two age groups, under 34 years and 34 years or over, of mothers of mongoloid babies and controls matched for age.

Few of the younger mothers of mongoloid babies, Ingalls reported, experienced vaginal bleeding during the pregnancy (1 of 21) whereas a high percentage had retroversion of

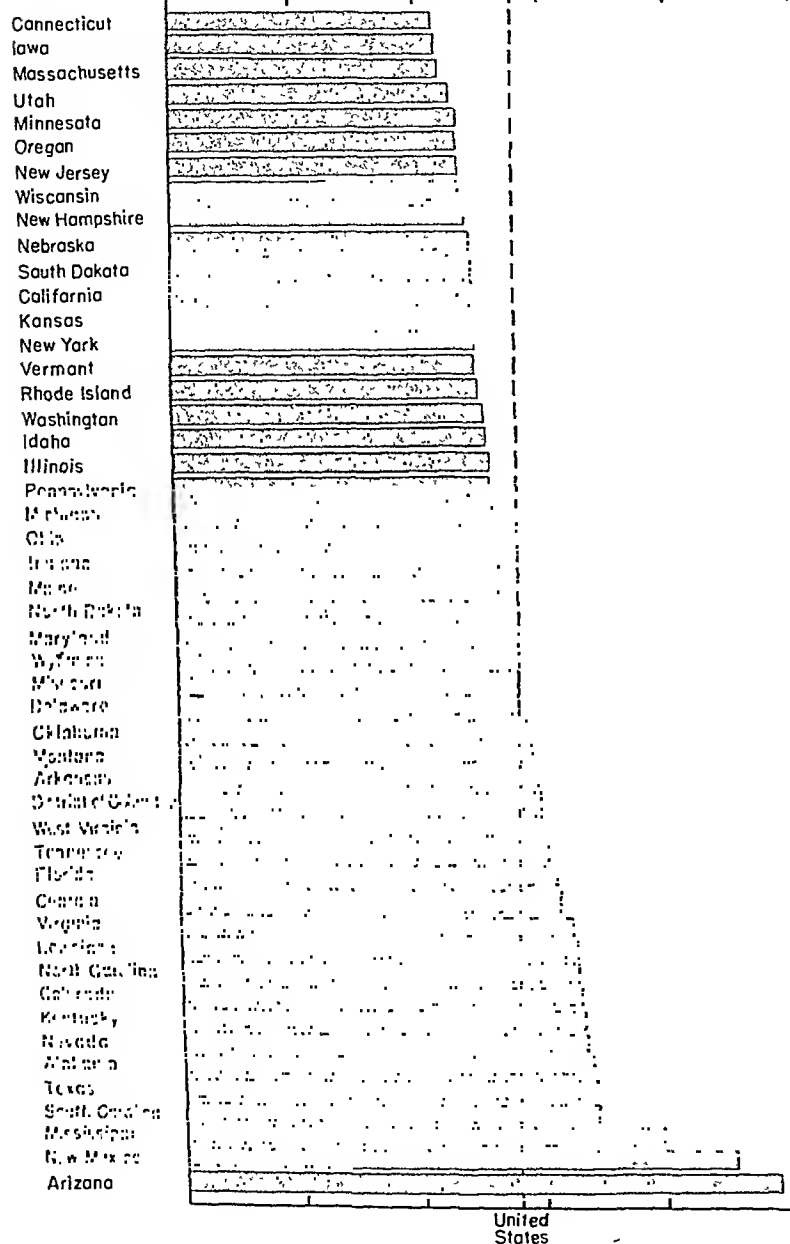
the uterus (9 of 21). Among the controls in this age group, 4 had vaginal bleeding, but only 3 had retroversion of the uterus.

Among the older women, vaginal bleeding was much more common in mothers of mongoloid babies than in their controls (9 as compared with 1 of 31), while retroversion of the uterus was equally common in each group (9 of 31).

Speculating on the significance of these findings, Ingalls observed that "retroversion might result in a temporary compression-stagnation effect if the gravid uterus gets trapped under the sacrum at the end of the second month of pregnancy just before it is due to enlarge upward into the pelvic brim." He believes the subject deserves intensive study.

Infant Mortality

Deaths under 1 year of age per 1,000 live births, 1953



Despite the great gains that have helped infants to survive their first year, gains especially notable among nonwhites, marked differences still appear in infant mortality rates of the respective States. (PHM chart)

To control the outbreaks, it was necessary to inhibit nasal colonization. Prophylactic use of the appropriate antibiotics proved effective after ordinary measures such as isolation of those infected and hexachlorophene bathing had failed.

A disturbing feature of these epidemics was the development of infection in most cases after discharge from the hospital. The field of contagion was thus widened through contact in the home, where the organism had a persistent extensive effect. At the same time, hospital staffs were probably not immediately aware of the epidemic situation and physicians and public health personnel treating infected persons in the community had no reason to suspect the nursery as an infection source.

The most important step towards control of these epidemics is to make all staphylococcal infections in very young infants and breast abscesses in nursing mothers reportable diseases, they concluded, pointing out that local health officers would then be able to warn hospital administrators about the suspected nursery infections.

Child Loss Suggests Priority In Maternal Health Service

Fetal and neonatal deaths are concentrated among the offspring of relatively small groups of women, according to Dr. Edward R. Schlesinger and Norman C. Allaway of the New York State Department of Health.

Results of a study of single births in upstate New York in 1951 suggest a need for concentrating maternal health services in these groups of mothers, Schlesinger said. The study, the first to classify risks according to the combined factors of age of mother, number of previous children born, and number of previous children lost, showed that 18 percent of the perinatal deaths occurred in a category with 8 percent of the deliveries.

Analysis of perinatal death rates for the offspring of mothers in each

| <i>Age of mother</i> | <i>Previous children born</i> | <i>Previous children lost</i> |
|----------------------|-------------------------------|-------------------------------|
| Any age..... | 1..... | 1..... |
| Do..... | Any number..... | 2 or more..... |
| 40 and over..... | | |
| 25 and over..... | 2 or 3..... | 1..... |
| 30..... | 3 or more..... | 1 or more..... |
| 20-24..... | do..... | 0..... |
| 35 and over..... | 0..... | |

5-year age group, according to number of previous children born and number lost, showed the greatest risk of perinatal loss among the groups in the above table.

The highest perinatal mortality rates were found among women 25 years of age and older who had lost four or more previous children. Women with one previous child had the lowest perinatal mortality rate for all age groups, and the lowest rate among these mothers was among those aged 25-29.

Priority of maternal health services for those in susceptible groups should reduce perinatal mortality more than services with no system of priorities, Schlesinger concluded.

Recommends Rubella Before Pregnancy

The consequences of maternal infection from german measles (rubella) should be anticipated by immunization, in preference to coping belatedly with them by use of gamma globulin or other measures, according to Dr. Theodore H. Ingalls, Harvard University School of Public Health. The consequences of rubella are statistically negligible in children and adults, but they are large and often tragic for the embryo, he said.

Clinical observations in Australia showed that a rubella epidemic, 1939-40, left a series of pathological consequences for the unborn babies: congenital cataract, deafness, mental retardation, and heart disease. American and European reports subsequently confirmed these observations.

Although the clinical observations definitely established that rubella in the first trimester of pregnancy

frequently proves teratogenic for the fetus, the numerical risk of maternal infection was not established. To evaluate the risk, Ingalls said, the normal as well as the abnormal outcome of pregnancies complicated by rubella must be known.

Rubella cases reported in Massachusetts since 1917 indicate long-term fluctuations of spread in addition to seasonal variations. An approximate 7-year rhythm is discernible with about three of the annual cycles often approaching a peak and the next few usually receding from it. Three of the four largest outbreaks occurred during times of war.

Since inability to measure epidemiologically the impact of rubella on the embryo has been due to technical difficulties in case finding and case reporting, demonstration of teratogenicity has been limited to clinical evidence.

The challenge now, said Ingalls, is to capture the virus and dispense it in a manner similar to the vaccinia. A practical step would be to allow women who have never had rubella to become actively immunized before marriage or pregnancy, especially in times of epidemic. Although it is conceivable, he felt that an elaborate plan of immunization comparable to that against poliomyelitis seems neither necessary nor feasible. A simpler method, he suggested, would be to have the disease—naturally or artificially.

Pediatricians, physicians, and school nurses should encourage the acceptance of developing rubella naturally and the resulting immunity with the same seriousness with which they urge immunization against tetanus. With regard to artificially acquired rubella, Ingalls pointed out that until the adult population is more highly immune than at present, there is a slight risk that school children will bring the infection home to a susceptible but pregnant mother. But, there is reason to believe that the gains would quickly outdistance the losses, he concluded.

School Health . . .

New York City Evaluates School Nursing Activities

Several suggestions for freeing the nurse from clerical and other non-nursing routines were embodied in the report of a survey of public health nursing activities in school, made by the New York City Health Department. The report was presented by Grace M. McFadden and Helen A. Miller, public health nurse consultants, and Marguerite P. Chapman and Florence R. Rich, statisticians.

The school health services in New York City have expanded greatly

since 1940. Accompanying this expansion has been a decrease in the size of staff. In 1953 the bureau of public health nursing undertook to learn how nurses could use their time in school to best advantage. First, it was necessary to learn how the average nurse spends her time in school. To do this, nursing service in a sample of 115 elementary and junior high schools, both public and parochial, was studied.

The nurse spends approximately 73 percent of her time in nursing activities, 25 percent in non-nursing ones, and the remainder in such events as civil defense and fire drills. Of 21 duties broadly classified, only

13 require her professional judgment and a background of public health nursing. These range from daily inspections to 7 types of conferences, including teacher, parent, and doctor. She uses about 28 percent of her time in case-finding activities and 30 percent in followups which are included in the 13 broad classifications.

Public health assistants are a recent addition to the school health service. Under the nurses' supervision they perform clerical and semitechnical duties. The findings suggest that these public health assistants should continue to be assigned to the school, but on a regularly scheduled basis, not on an occasional basis, and at a ratio of at least 20 percent of the nurses' time.

Where this ancillary help was available, the report stated, nurses were able to increase time spent in nursing functions by 7 percent. However, nurses still continued to perform non-nursing activities when public health assistants were in the school. Obviously, clerical duties are assignable, but the survey suggested that there is need for better orientation of nurses in the ways of working with such help. Emphasis should be placed on the type of work which nurses can delegate while still maintaining overall responsibility. It also suggested a qualitative review of all nursing activities in school to determine whether more might be shared with other school personnel or assigned to ancillary help. This should lead to a more discriminating

use of nursing time for work which unquestionably should be done by nurses.

Nurse Aide Program Proves Popular

The use of nurse aides in school health clinics has the enthusiastic endorsement of Margaret A. Bauer, nursing supervisor in the Arlington County, Va., public school system.

Evolving from the need to give school nurses some assistance with record details, the Arlington program was initiated with a student aide program in one of the senior high schools in 1951 and the employment of an adult assistant in one of the high school clinics in 1952.

Since then, three other paid workers have been assigned full time to a junior or senior high school, and the student program has spread to all but two of the secondary schools.

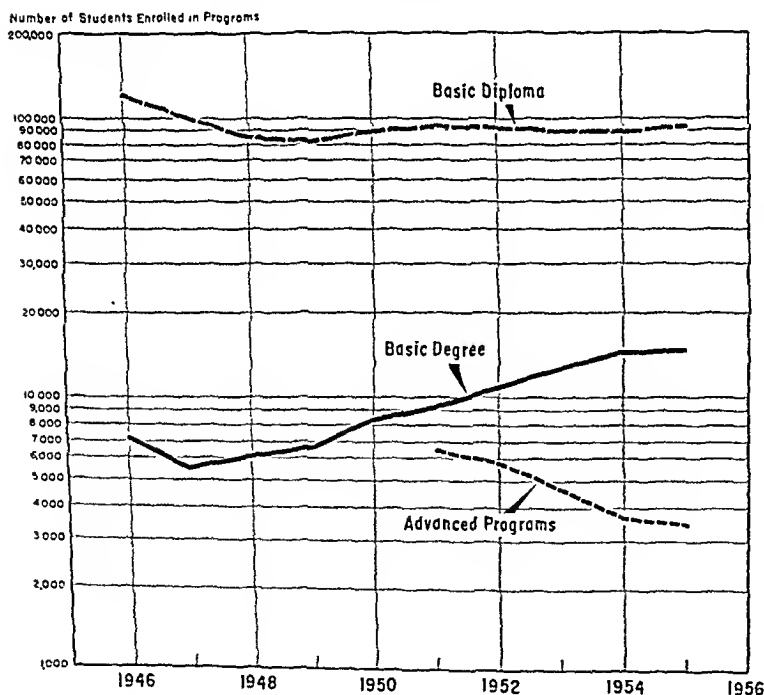
The student program is popular with nurses, students, and parents, Bauer stated. It requires constant supervision, however, and for that reason may not be feasible under some circumstances, she added.

To qualify as an adult assistant, a person must have successfully completed high school and standard Red Cross courses in first aid and care of the sick. Past experience in working with teen-agers and active participation with the Boy Scouts and 4-H clubs plus maturity, warmth, and understanding of adolescence are desirable qualifications also.

Registered nurses are not hired as adult assistants. The adult aide is trained on the job by the professional nurse. Her general duties include first aid, administering to the ill, reporting to parents, keeping the clinic log, assisting in screening procedures, recording test data on health records, and taking charge of supplies and linens.

The Arlington program has reaped the advantages of freeing the nurse from handling approximately 30 student visits daily, of eliminating

Trend in Nursing Students



In 1955, nursing students working for a basic degree comprised 14 percent of the total number (108,000) enrolled in State-approved schools, nearly three times the percentage in 1946. Total enrollment had not increased, however. Enrollees in advanced programs had declined by nearly 50 percent since 1951. (PHM chart)

housekeeping chores from her schedule, and of keeping the clinic open in her absence. The aide is in a position to control interruptions when the nurse is talking to a parent, working with a pupil, or in conference with other members of the professional team, Bauer explained.

There are no disadvantages to the program if the aide has been selected wisely, Bauer assured. An aggressive person, she pointed out, may rebel against the constant supervision of the school nurse, and the timid soul sometimes lacks confidence.

Student aides work directly under the nurse aide. Both boys and girls are eligible. As they become trained, they carry out many of the functions of the adult assistant. The chief exception is that students are never permitted to handle confidential nursing records.

Student aides in junior high receive credit for each school year of experience. They are graded on factual knowledge and performance, and the grade is recorded on regular report cards.

Senior high students receive points toward an honor card or a school activity letter. The clinic period is arranged to coincide with study hall periods. Only boys and girls with average or better intelligence and performance are eligible. Problem students are paired with stable and mature students. Boys are never paired with boys.

The student program, Bauer noted, gives the youngsters valuable experience in the basic techniques of caring for the sick, an opportunity to assess their personal aptitudes for future vocations, and a maturing experience that will carry over into adulthood. Along with the practice of first aid, she said, they learn the rudiments of professional behavior and poise in the presence of illness and accidents.

This experience in a clinic setting has already been instrumental in recruiting future nurses from among the girls, Bauer reported. A num-

ber have formed the nucleus of a future nurses' club. Though it is not known how many have entered nursing or the allied medical professions, she knows of at least five

who have entered nursing training within the past 2 years.

"We like to think the student aide experience was a factor in choosing this profession," she said.

Dental Health . . .

Philadelphia Plans Dentistry For Homebound Patients

Provision of dental care to homebound and institutionalized patients was recommended by Dr. J. M. Wisan, chief of the section on dental health, Philadelphia Department of Public Health.

Wisan said that the Council on Dental Health of the Philadelphia County Dental Society plans to appoint a committee made up of dentists, physicians, a psychiatrist, a nurse, social workers, and other health and welfare personnel to study the dental needs of nonambulatory patients.

Suggestions have been made that this committee also train dentists to use specialized equipment and techniques for treating these patients, obtain the portable equipment necessary to treat bedbound and wheelchair patients, and formulate and implement a treatment program for them. Details of the proposed program follow.

Study of Dental Needs

In collaboration with private practitioners, we expect to assign a dentist to examine 73 homebound patients who are on the home care program of the northern division of the Albert Einstein Medical Center and 45 persons on the "meal and wheel project." This survey will provide answers to the following questions: When was dental treatment last provided? Are routine dental examinations required by this group? What types of dental treatment are required? How much

dental care is needed? How well do the patients carry out dental hygiene practices?

Professional Training

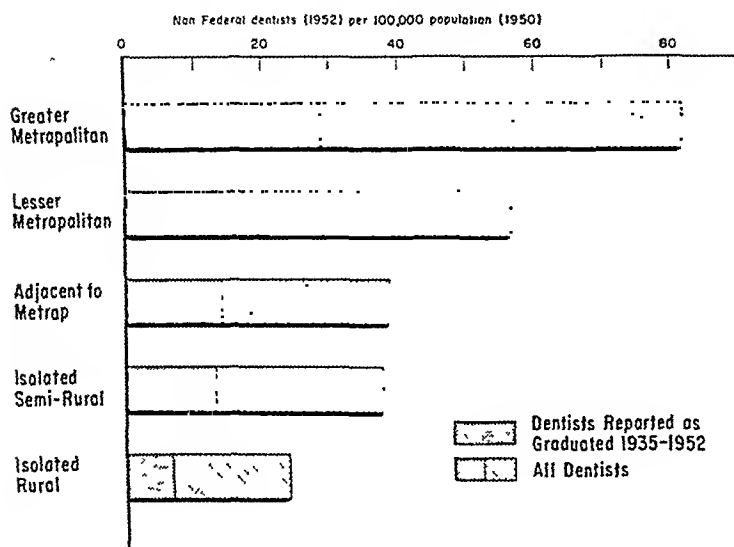
Since specialized equipment and unique techniques are needed for treating chairbound or bedbound patients, participating dentists should be taught how to treat the chronically ill. Health departments and dental schools can offer courses of training similar to those offered in the fields of oral cancer and treatment of handicapped children. Hospitals can sponsor teaching programs. Discussions of technical procedures will be necessary, and it will also be useful to study attitudes of patients and the psychological approaches required for treating chronically ill patients.

Perhaps the dental school will assign senior dental students to assist in this program so that they may obtain experience in treating homebound patients.

Equipment

Some hospital dentists have constructed ingenious devices for providing dental care for bedbound patients. For example, a dressing cart has been rebuilt into a dental bedside unit, with an attached dental engine, a spotlight, a basin, and a shelf for instruments and medicines. A portable engine and light may be used for homebound patients, and some will require a portable X-ray unit. The women's auxiliary of the dental society is raising funds for the necessary equipment. Transportation for this equipment must be arranged.

Urban-Rural Differences in Dentist Supply



Metropolitan areas in 1952 had nearly 3 times as many dentists per 100,000 population as rural areas. In all areas, about one-third of the dentists had graduated since 1935. (PHM chart)

Treatment Program

Provision for treating hospitalized, institutionalized, and homebound patients must be included in a treatment program for the chronically ill, and some hospitals have the necessary personnel and equipment to perform this task. Our plans, therefore, will be concentrated on smaller hospitals and institutions lacking dental clinics and on home treatment programs. Administrators of larger hospitals will be asked to consider the desirability and feasibility of sending dental interns and residents to homes of patients requiring treatment.

Patients

Patients unable to pay private dentists should be given priority under the program, although persons whose dentists cannot provide home treatment should be included on a fee basis. The proportion of chronically ill persons who are unable to pay for dental treatment will undoubtedly be high for two reasons: The expense of long-term illness is

crushing to most people, and the expense of providing dental treatment at home is greater than the expense of providing treatment in clinics and dental offices.

Dental Services

In well-equipped hospitals, dentists can furnish all treatment necessary for the systemic and oral health of a patient. However, in spite of the difficulties of bringing equipment into hospitals, homes, and institutions, adequate treatment should be offered patients who cannot visit the dentist. For the bedbound patient, adequate treatment would include relief of pain, removal of unsavable infected teeth, treatment and filling of carious teeth, treatment of periodontal diseases, replacement of missing teeth when necessary to maintain oral and systemic health, diagnosis and treatment of oral diseases, as well as therapeutic sedation and local and general anesthesia. When examining adults, particular attention should be given to precancerous conditions and early cancers.

Routine dental examinations at 90-day intervals for children and at 6-month intervals for adults are recommended. Because of the difficulty of treating bedbound patients, precautions that would reduce the backlog of dental defects would be advantageous. Experience indicates that regular examination and treatment do lessen the need for extensive dental care.

Pilot Program

One Philadelphia hospital plans to sponsor a pilot program of dental care for homebound and institutionalized patients, which it is hoped will lead to participation by other hospitals. Perhaps one mobile unit can be used by several hospital staffs. Staff dentists, interns, and residents may participate under the direction of their chiefs of dental service, and assignments can then be distributed so that the program will not prove burdensome for any one institution.

The health department, the Visiting Nurse Society, and other agencies interested in home medical services will be asked to help in the program. In the preliminary stages, financing will be sought from the Community Chest and from foundations. Plans for continued financing will be made later.

A register of chronically ill patients at home and in institutions is being set up by a subcommittee of the Health and Welfare Council. Hospitals have information concerning their bedbound patients, and the files of the Department of Public Assistance will be used for referrals.

Dentists interested and trained in treating bedbound chronically ill patients will be listed and assigned as needed.

Philadelphia Agencies Plan Dental Health Program

"Effective community coordination for dental health is . . . a joint action of professional groups and community agencies in developing and implementing policies and pro-

cedures for dental programs and in stimulating citizen participation to interpret policies and to attain public support through democratic processes." So stated Dr. J. M. Wisan, chief, dental health section, Philadelphia Department of Public Health, in opening the panel discussion on community planning of a dental health program.

Wisan suggested eight criteria for appraising community coordination:

1. Organization of a coordinating dental health committee by the agency sponsoring the dental program.

2. Assignment of definite responsibilities to members of the coordinating committee.

3. Designation of professional standards for the program by the dental society through its council on dental health.

4. Determination by the dental health committee of rules for accepting patients, types of locations of clinics, standards of treatment, measures to provide an adequate flow of patients, and dental health education measures.

5. Organization of local, district, and neighborhood committees to stimulate citizen participation in large cities.

6. Agreement of administrators of community dental care programs on a plan of reporting regularly to the coordinating committee: number of persons receiving treatment, number of visits by patients, number of teeth filled and type of fillings, numbers of permanent and deciduous teeth extracted, number of other treatments provided, fees charged per visit or per operation, rules for eligibility of patients, and number of dentist-hours spent in treatment.

7. Participation by the coordinating committee in evaluation and re-direction of the dental program.

8. Invitations by the dental health committee to key persons in the community to help organize and attend conferences for discussion and improvement of existing dental programs.

Other participants in the discussions were Drs. Abraham Cohen, supervisor of dental services, Board of Public Education; John P. Loohey, dental supervisor, Philadelphia parochial schools; Albert L. Borish, chairman, Council on Dental Health, Philadelphia County Dental Society; and J. L. T. Appleton, professor of microbiology, University of Pennsylvania School of Dentistry.

Public Schools

An incremental dental care program for public school children has been carried on by the Philadelphia Department of Health since 1954, Cohen reported. In the beginning, treatment was restricted to 6-year-olds, although some teen-agers were treated when time permitted, and emergencies were handled. This year, he said, the accumulated needs of 8-year-olds and the maintenance needs of the 6- and 7-year-olds treated during the past 2 years will be taken care of.

Dental clinics are being established in school buildings, Cohen said, minimum standards of treatment have been compiled, and spot checking of completed dental work is carried on in school districts. School nurses are responsible for the flow of patients to the dental clinics. Nurses bring eligible pupils to the clinic or arrange for a parent to bring them. Nurses also see that clinic time is used to treat older children if the number of 6- and 7-year-olds is insufficient.

The board of education has endeavored to eliminate the sale of sweets by private vendors in school cafeterias and school yards and to encourage the pupils to eat fresh fruit instead. Fruits purchased by school principals through wholesalers are delivered to the school. Visual aids are used to promote the program.

This project, plus Philadelphia's fluoridated water supply, "will do more to increase the percentage of caries-free teeth than any other aspect of dental health education," Cohen stated.

Parochial Schools

In Philadelphia's parochial schools, a program of periodic dental examinations, sponsored by the State health department, was begun in 1946, Loohey stated, and from the beginning the program has been integrated with the county dental society's council on dental health.

Projects to promote dental health in the parochial schools have included an annual poster contest, assembly programs and distribution of educational materials, sale of toothbrushes at a reduced rate, membership in the coordinating committee of the Philadelphia County Dental Society, cooperation of the nursing corps of the schools in the selection of children for clinic treatment, installation of dental clinics in 5 schools and 1 settlement house, establishment of an escort service for the children, and coordination of efforts to obtain dental care in three hospitals.

The key group in coordinating the efforts of all agencies has been the council on dental health of the Philadelphia County Dental Society, Loohey said, and membership in that group has made possible expansion of a program which provides the best care for parochial school pupils within the framework of organized dentistry.

County Dental Society

Reporting on the work of the Philadelphia County Dental Society's Council on Dental Health, Borish said that the council's efforts had resulted in "a true community approach to community dental health problems." The council, he stated, has six objectives:

1. To have all agencies with dental programs represented on the council, with voting privileges.

2. To have all policies approved by the board of governors of the county society.

3. To be the informational center for community dental needs and resources.

4. To help coordinate all community dental programs so that they will perform the maximum service.

5. To help each agency obtain community support.

6. To help evaluate programs and induce improvements.

The revised Standards for Dental Procedures for the Child has been sent to all public and private dental agencies in Philadelphia, Borish stated, and has been published in local and State journals.

The subcommittee on dental agency administrators has made plans to standardize programs and records, he said, and refresher courses have been offered by and for hospital staff dentists.

Finally, through work conferences, community groups have come to recognize the objectives of the dental health program and are cooperating in achieving them, Borish concluded.

Health and Welfare Council

Concerning the role played by the Health and Welfare Council in promoting community dental health, Appleton stated that one of the council's most important functions is "to encourage, and to participate in, the processes of effective coordination."

The council has sponsored or co-sponsored dental surveys, studies, and conferences and is reviewing the resources available or required to meet dental health needs in Philadelphia.

Reviewing the panel discussions, Appleton said that the criteria for appraising community coordination are realistic, that organized dentistry in Philadelphia is socially alert and responsible, that school dental programs are effective, and that the trend toward installation of public health dental clinics in school buildings is most promising.

In conclusion, he said that real progress has been made toward effective cooperation but that it would "be naive to claim that coordination is now 100 percent efficient, or ever will be." Coordination, he stated, is "a never-ending process, adapting to . . . the ever-changing constellations of new personalities, conditions, and experiences."

Chronic Illness Surveys To Include Dental Exam

Studies in Virginia to determine the extent and nature of the chronic illness problem will include a complete dental examination, according to Dr. David R. Wallace of the Virginia State Department of Health.

These studies, to be carried out by the State through local health departments, will ascertain the number of chronically ill and, in each case, the diagnosis, mobility status, need for medical care, and possibilities of rehabilitation. Only when such information is available can communities plan adequately to cope with chronic illness, Wallace stated.

Provision of dental care for the chronically ill often will take the dentist away from his private office, to a private home, a nursing home, a health center clinic, or a hospital, Wallace pointed out. The patients confined to their homes, he indicated, will present the greatest problem.

To illustrate the difficulties in providing a complete dental service for the chronically ill, Wallace mentioned problems associated with a few of the chronic diseases. In mental illness, he said, general anesthesia often must be used. In epilepsy, the dentist must avoid using removable bridges or dentures. When performing dental operations on patients with cardiac disease, special precautions must be taken.

Dental schools must train their students to cope with the dental problems of the chronically ill, Wallace advised. This might be done by giving students the opportunity of working with patients in hospitals and nursing homes. Special emphasis, he said, should be placed on such oral conditions as gingivitis, advanced periodontal disease, Vincent's infection, and recognition of the oral manifestations of such systemic diseases as tuberculosis, Addison's disease, nutritional disorders, diabetes mellitus, and oral cancer.

Wallace also recommended that the dental student become ac-

quainted with the procedures of multiphasic screening. This will enable him, he said, to share effectively in such a survey in his community.

New Apparatus Designed For Fluoride Recording

Two systems for continuous recording of the total fluoride content of a water supply were described by F. J. Maier and Ervin Bellack, who are with the Division of Dental Public Health, Public Health Service.

One newly designed apparatus combines double distillation with conductivity measurement. This apparatus isolates the fluoride ion from other interfering ions, Maier said.

A continuous record of the fluoride content, Maier explained, will not only serve as an indication of the operation of the fluoride-feeding system, but will provide a graphic history of the fluoride concentration at any previous time. Also, the recorder can be used as the primary device for actuating the fluoride-feeding mechanism, he stated.

The double-distillation apparatus is a further development of the single-distillation device described by R. D. Frazier and H. G. Oldfield of the Minnesota Department of Health. Their device, Maier said, gives a distillate satisfactory for direct chemical analysis of fluorides, but not for conductivity measurements.

With the double-distillation assembly, only those ions that distill over from the sulfuric acid used in the first still (chloride of nitrate, for example) are likely to contribute errors to the conductivity measurements. However, Maier pointed out, these may accumulate for some time in the second still before they appear in the final distillate. Thus, accurate determinations can be obtained by cleaning the apparatus and replacing the acid at appropriate intervals.

Except for daily changing of the

chart on which the conductivity is recorded and occasional replenishing of the ink used in the recorder, the unit may be allowed to operate continuously without attention for as long as the accumulation of ions in the first still will permit, Maler stated. For water containing relatively small amounts of dissolved solids, this may be as long as a month.

Rapid Colorimetric Method

The second apparatus Maler described combines continuous distillation with the rapid colorimetric method for measuring fluorides. The design of this apparatus provides for continuous metering of the water sample and two reagents, the mixing of the three ingredients, and the passing of the mixture through an absorption cell in a photometric device. A recorder, graduated in fluoride units, is connected to the photometer.

Incoming water, Maler said, can be distilled automatically and continuously by the apparatus described above. However, only one distillation is necessary because of the tolerance of the eriochrome cyanine R reagent to most interferences, he added.

Fluoridation in Grand Rapids Benefits Older Children

According to the results of the annual dental examinations in Grand Rapids, Mich., fluoridation has benefited not only children born since fluoridation was begun but also those born before, reported Dr. Francis A. Arnold, Jr., director of the National Institute of Dental Research, Public Health Service.

For 16-year olds, for example, the DMF rate decreased 26 percent between 1944 (the year before fluoridation was started) and 1954, he said. For children drinking fluoridated water continuously since birth, the percentage decrease ranged from 50 to 75 (see table).

The 1955 examinations of children

aged 11 through 16 years indicated that the beneficial effects of fluoridation continued on through the 11th year of fluoridation, Arnold added. Further reductions in the DMF rate were observed among children of each age.

At the same time, fluoridation in Grand Rapids has not produced a significant degree of dental fluorosis, Arnold pointed out. For 11-year olds, only 4 percent had even "very mild" fluorosis in 1955. None had a higher degree, and 89 percent were "normal."

This study, like many others, has demonstrated the certainty of fluoridation as a public health procedure for improving dental health of a community, he asserted. Moreover, he said, in none of the studies has there been any scientific evidence to suggest an adverse effect on other biological systems of the body.

Fluoridated Water Inhibits Caries in Erupted Teeth

A study of children in Grand Rapids and Muskegon, Mich., indicates that artificially fluoridated drinking water inhibits caries in teeth already erupted. The protective ef-

fect on teeth in the pre-eruptive stage has been established in earlier studies.

Although the protection given erupted teeth of a single individual is small, the total effect on a large number of people may have public health significance, stated Dr. Richard L. Hayes, Dr. Norman Littleton, and Carl L. White, of the National Institute of Dental Research, Public Health Service.

Between 1944-45 and 1956, Grand Rapids children experienced fewer and smaller cavities in approximal surfaces of first permanent molars than did Muskegon children, Hayes reported. The Grand Rapids children, he explained, had drunk fluoridated water since 1945, but the Muskegon children, only since 1951.

All the children studied had two or more first permanent molars in 1944-45 and were continuous residents of their respective cities. The two major study groups, each composed of 116 children, were matched for caries susceptibility on the basis of the 1944-45 examinations.

For statistical analysis, a system for scoring caries according to size or depth of the cavity or filling was used, Hayes stated.

On clinical examination, the size

Percentage decrease in caries rates after 10 years of fluoridation in Grand Rapids, Mich.

| Age (last birthday) | Number children examined | | Percentage reduction in caries rate | |
|---------------------|--------------------------|------|-------------------------------------|-----|
| | 1944 | 1954 | def | DMF |
| 6 | 1,789 | 561 | 54 | 75 |
| 7 | 1,806 | 751 | 48 | 63 |
| 8 | 1,647 | 567 | 43 | 57 |
| 9 | 1,639 | 477 | 35 | 50 |
| 10 | 1,626 | 515 | 17 | 52 |
| 11 | 1,556 | 499 | 2 | 54 |
| 12 | 1,685 | 260 | --- | 52 |
| 13 | 1,668 | 224 | --- | 48 |
| 14 | 1,690 | 250 | --- | 38 |
| 15 | 1,511 | 240 | --- | 35 |
| 16 | 1,107 | 198 | --- | 26 |

Mean caries scores for approximal surfaces of first permanent molars, matched groups of children in Grand Rapids and Muskegon, Mich.

| Examination | Grand Rapids | Muskegon | Difference |
|--------------------------|--------------|----------|------------|
| Clinical----- | 0.83 | 1.22 | 0.39±0.11 |
| X-ray----- | 1.73 | 1.99 | .26±.12 |
| Clinical plus X-ray----- | 1.74 | 2.02 | .28±.12 |

of the cavity or filling was recorded as small, medium, large, or "pulp exposure" and scored from 1 to 4. On X-ray examination, the depth was recorded as enamel only, or shallow, moderate, or deep dentin and scored similarly. A missing surface was scored 4. For each individual, the scores were totaled and divided by the number of surfaces at risk to give a "caries score."

The difference between the two groups of children in caries experience of approximal surfaces was evident from the clinical examination alone, from the X-ray examination alone, and from the two examinations combined (see table).

The difference in the mean caries scores for the buccal plus lingual surfaces, Hayes said, was about the same as the difference for the approximal surfaces. He considers this finding "curious" since the caries susceptibility of the two types of surfaces is very different.

The mean caries scores for occlusal surfaces was also lower for the Grand Rapids children than for the Muskegon children, although the number of decayed or filled occlusal surfaces was the same in the two cities, Hayes observed.

Periodontium Not Injured By Use of Fluoride Water

The use of fluoride-bearing water does not adversely affect the prevalence or severity of periodontal disease in children or adults, according to examinations of more than 20,000 persons, reported Dr. Albert L. Rus-

sell of the National Institute of Dental Research, Public Health Service.

In each of three comparisons between a group drinking fluoride-bearing water and a group drinking fluoride-free (or essentially free) water, the fluoride group exhibited the more favorable periodontal condition on direct examination, Russell said. Also, extractions because of periodontal disease were somewhat less frequent among adults in the fluoride communities.

One of the comparisons was between 144 adults aged 20-44 in Colorado Springs (2.5 p.p.m. F) and 379 adults in the same age group in Boulder (fluoride free), Colo. In Colorado Springs, 52.8 percent were free of periodontal disease as compared with only 38 percent in Boulder. Once it occurred, however, the

disease was equally severe in the two communities, Russell said.

For older adults, a comparison was made between residents of Bartlett (8.0 p.p.m. F) and residents of Cameron (0.4 p.p.m. F), Tex.; for children, between residents of Newburgh (1.0 p.p.m. F) and residents of Kingston (fluoride free), N. Y. The results were similar to those for Colorado Springs and Boulder.

Study of the question was also afforded by examinations of some 18,000 native and migrant children in communities using water containing about 1.0 p.p.m. F, according to Russell. Comparison of the native children with the migrants, he said, revealed no adverse effect of the fluoride water on periodontal health. In fact, there was a weak tendency for improved periodontal health among the native children with an increase in the length of time they had drunk fluoridated water.

The findings are "wholly incompatible with any hypothesis that the periodontal tissues of children or adults are harmed by use of a fluoride-bearing water," Russell concluded. However, he pointed out, they are not adequate to support a hypothesis that fluoride water results in improved health of periodontal tissues.

Safety . . .

Farm and Home Safety Needs New Approach

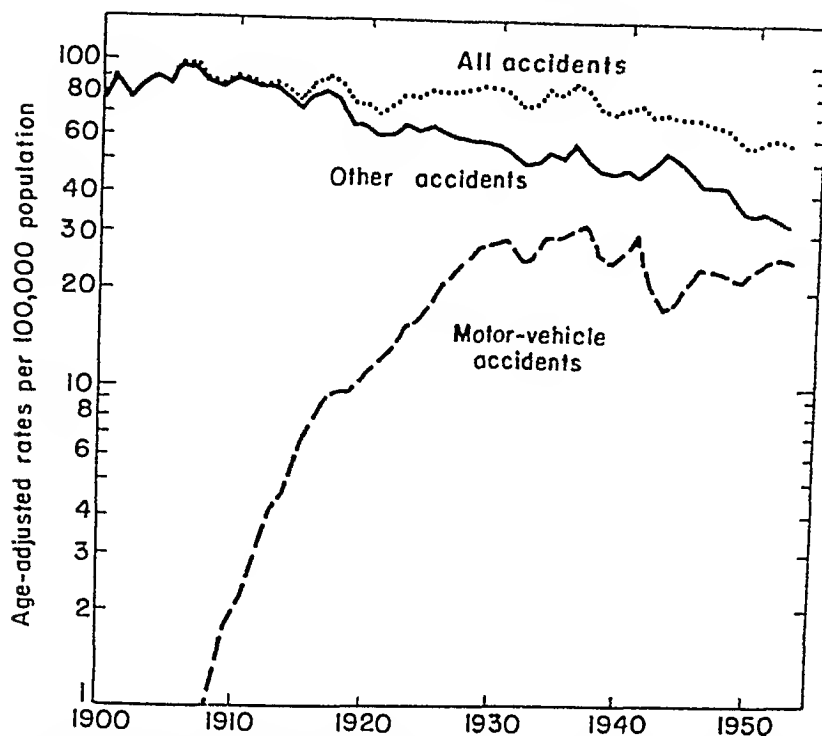
To emphasize the need for farm and home safety programs, Dr. Charles M. Cameron, Jr., acting chief of accident prevention for the North Carolina State Board of Health, pointed out that in the past 5 years more than 100,000 Americans have lost their lives in their homes. Farming as an occupation, he said, ranks first in number of deaths from accidents.

Although a great number of safety

programs have been initiated in the past few years, recent surveys indicate that there is a need for still greater awareness on the part of public health workers that accidents are a crucial health problem. An inventory made by the National Safety Council in 1955 listed 591 agencies that had carried out some type of home safety activity in the previous year. Public health agencies were far outnumbered by farm groups, women's clubs, safety councils, and other organizations.

More safety education on a face-to-face basis is needed, Cameron as-

Death Rates for Accidents



Were it not for motor-vehicle accidents, rates of death from accidents per 100,000 population could have shown a marked decline since 1910. Motor-vehicle accident death rates, about 24 deaths per 100,000 population in 1953, declined from an average of 8.9 deaths per 100 million miles in 1938-42 to 4.5 in 1953. (PHM chart)

serted, suggesting that this process is especially suitable for public health workers, who have gained an intimate understanding of the individual and his family.

Traditional safety activities, according to Cameron, have included short-term campaigns, safety drives, and promotional programs utilizing the media of public information—pamphlets, booklets, posters, newspaper articles, radio spot announcements, and safety proclamations.

Has anyone attempted to determine just which of these efforts actually do change human behavior toward safer living? he asked.

Admittedly, he said, it might not have been wise to delay public health safety programs until we could answer this question, but certainly every effort should be made to answer it as soon as possible.

Greater cooperation by administrators, public health nurses, sanitarians, and health educators is another need in accident prevention work, according to Cameron. It was apparent early that all public health disciplines would be essential if accidents were to be attacked successfully, and many local health departments initiated accident control activities on that basis, he said. However, in some departments, home safety is considered a nursing activity or the exclusive responsibility of the health educators. The labeling of any program as the distinctive property of a single discipline does not, he concluded, stimulate interest among the others.

Failure to utilize fully all community safety resources has further hamstrung many health department accident prevention programs, Cam-

eron said. Industrial safety programs, community safety councils, municipal fire departments, and agriculture extension programs have been repeatedly cited as valuable allies in planning and conducting meaningful safety programs, yet the location and facilities of these are unknown to many public health workers.

The role of the local health department as impartial coordinator of all community safety interests he envisioned as another of the unique contributions public health can make to the safety movement.

Automobile Accidents Related to Mileage Driven

The more miles a person drives, the more likely he is to have an accident, according to a home interview study of 810 drivers in Schenectady, N. Y. This result from one phase of a research project on driver behavior and accidents was reported by Dr. Jean K. Boek, Russell Sage College, Albany, N. Y.

Another finding was that men tend to have more accidents than women, even when the factor of exposure (number of miles driven) is held constant. In fact, Boek said, the percentage of men in the low exposure group who had accidents was higher than the percentage of women in the high exposure group.

Age, weight, schooling, usual speed on the open road, drinking, and smoking were other characteristics on which Boek reported. She compared drivers who had no accidents, those who had accidents for which they were responsible, and those who had accidents for which they were not responsible.

In another phase of the project, Boek said, no relation was found between "unsafe" driving and being in accidents, nor were there any significant age or sex differences in driving behavior. In this part of the study, which covered 550 drivers, nine driving acts, such as stopping and turning, were observed without

the drivers knowing it and scored "safe" or "unsafe."

This research, Boek concluded, indicates the importance of giving careful attention to measurement of exposure to accidents, of studying men and women drivers separately, and of studying a random sample of drivers in their communities so that variables may be observed as they actually operate.

Support Driver Education Health Officials Asked

A five-point program to improve the behavior of automobile drivers was proposed by Dr. Herbert J. Stack, director of the center for safety education, New York University. Underlining the urgency of the problem, he asserted that bad driving practices caused about 80 percent of all traffic deaths last year.

Stack appealed to health authorities to ally themselves with the traffic education phase of the safety movement. "The accident prone could be thought of as sick drivers," he pointed out. State and local health departments, already cooperating with the home safety campaign, will make a valuable contribution by extending their interest to traffic safety education, he stated.

Accidents are caused chiefly by faulty attitudes and bad personality characteristics rather than by a lack of driving skill, he said. New York University studies show that social irresponsibility is the worst offender.

Experience has proved that improved, accelerated enforcement and a strengthened police force will reduce accidents, Stack said, but the gigantic task of effectively regulating 65 million drivers on our thousands of roads calls for more than police efforts.

He urged uniform motor-vehicle rules of the road, regulations, and driver's license laws, pointing out that many States issue driving licenses almost as freely as they do hunting permits. He commended the 14 States using the point system

with a graduated scale of demerits. Stack also praised driver behavior clinics. License revocation and suspension are the most efficient sanctions in the driver improvement program, he said.

Traffic engineering undoubtedly contributes toward good road behavior. Devices such as medial strips on four-lane roads, channelizing traffic, and information and warning signs reduce human error substantially.

Strengthening the work of the traffic courts, according to Stack, is essential. Lack of uniformity and of trained magistrates, overcrowded sessions, and poor conduct of many courts foster a negative attitude toward traffic control.

Education

Stack pointed out that most drivers acquired their skills in commercial driving schools, or haphaz-

ardly from friends or relatives, with little direction in proper driving attitudes. However, the driver education movement in the Nation's high schools trained nearly 1 million students last year. The State of Michigan, moreover, will now require license applicants under 18 years old to have completed an approved course. Other States will soon follow, Stack believes.

Automobile dealers have cooperated by lending more than 6,000 cars without cost. Stack also mentioned the contribution of more than \$200,000 from casualty insurance companies and oil firms for teacher scholarships, and the endorsement of the driver education program by well over 80 organizations.

Educating the mass of adult drivers, most of whom appear to be satisfied with their performance, constitutes the greatest challenge.

Environmental Health . . .

Food Poisoning Outbreaks Traced to Milk Powder

Spray-dried nonfat milk solids were implicated in a series of 19 outbreaks of acute gastroenteritis among Puerto Rican school children early in 1956.

Reporting the epidemiological work in tracing the source and agent were Dr. Rolando Armijo of the University of Puerto Rico School of Medicine, Dr. Rafael Timothee of the Puerto Rico Department of Health, and Dr. D. A. Henderson and H. B. Robinson, both of the Public Health Service.

The outbreaks, the first associated with spray-dried milk in the United States, occurred between January 23 and February 21 in 16 schools participating in the school lunch program. More than 775 children became ill.

Food histories of the school chil-

dren suggested spray-dried milk as the responsible food. Confirmation was achieved by a human volunteer experiment.

Milk powder remaining in an opened can that was obtained the day following one of the outbreaks was reconstituted and given 13 adult volunteers by random selection. Nine of them developed gastroenteritis symptoms, five to a marked degree. Of the 13 controls given commercially purchased milk powder, only 2 developed mild symptoms.

Clinical symptomatology and the incubation period pointed to staphylococcal enterotoxin as the responsible agent. The principal symptoms were nausea, vomiting, abdominal pain, and diarrhea without fever, beginning from 1 to 5 hours following the noontime school lunch. There was virtually complete recovery within 24 hours.

The negative bacteriological results eliminated the staphylococcal organism itself. Toxicological tests

for metallic poisons were also negative.

That enterotoxin was present in the dried milk prior to reconstitution was adduced from the fact that the volunteers drank the milk almost immediately after it was made. And in none of the 16 schools was the reconstituted milk allowed to stand more than 5 hours before serving. In 9 of the schools the time interval was 2 hours or less.

Three lots of milk powder from 1 of the 8 processing plants involved were indicated as the responsible source of the outbreaks through a detailed epidemiological search, complicated by the lack of adequate identification on the individual cans. Bacteriological plate count records of samples from this plant were shown to be clearly out of line with those obtained from other plants.

Review Processing Criteria

The report emphasized the need for a careful review of the methods of processing and testing the milk and labeling packages in view of the substantial quantity of spray-dried milk produced and its worldwide distribution. The Puerto Rican school lunch program now uses some 4 million pounds a year.

Under the present testing procedures samples of all dried milk processed are submitted to the dairy inspection laboratory for plate analysis before release for distribution, the report related. But it pointed out that with only one test made for each 15,000 to 20,000 pounds of powder produced, a contaminated batch might escape detection. The testing lots are obtained by pooling 4 to 5 samples.

In suggesting consideration of the validity of the plate count itself, the report cited the plate count of but 30,000 colonies per gram for the milk used in the human volunteer experiment, a figure ordinarily certifying the milk as extra grade. It was pointed out that the heat to which the milk is subjected in the drying process might, in fact, reduce the bacterial flora to this level without destroying the enterotoxin.

Federal-State-Local Units Set Water Resources Policy

Forecasting growing demands on our water resources, Roy W. Morse, Department of the Interior, and staff member of the Presidential Advisory Committee on Water Resources Policy, reviewed recommendations of the committee to meet these demands.

In many parts of the western United States, the water supply has always been critical while in the more eastern part an ample supply has usually been taken for granted, Morse said. The New York City shortage in 1970 made many people aware of the dangers of a general water shortage situation.

Water Supply

Morse divided water supply into four major categories: public water supply, including domestic, commercial, and industrial use; self-supplied industrial use; steam electric power; and irrigation. These, he said, account for 98 percent of the total use.

Basic to the growing demand for water is the growth in population and the increased consumption per capita since World War II. Of the more than 200 million population predicted for 1975, approximately three-fourths will be served by public water supplies, Morse estimated. The daily water demand will rise from 17 billion gallons to an estimated 30 billion gallons. Further, it is estimated that \$1 billion a year during the next two decades will be required to eliminate present deficiencies, offset obsolescence, and adequately serve the growing population.

Demand for self-supplied industrial water has grown faster than demand for public use, Morse told the engineers. New processes require increasing quantities of water, about 60 billion gallons a day at present.

By 1975, steam electric plants are expected to require 120 billion gallons a day, twice the volume of the

present use, largely for cooling, Morse said.

Irrigation will require about 170 billion gallons per day by the same date. The usable return flow ranges from 20 to 60 percent, he said.

With adequate planning and with adequate acceptance of the many opportunities for increased water use, this future demand can be met. The greatest problems will be those resulting from unequal distribution of our national water resources.

Endorsing the objectives formulated by the Presidential Advisory Committee on Water Resources Policy, Morse said there are many approaches to the same end. Some would seek greater Federal authority while others fear Federal interference and dislike any assistance. The committee, he said, concluded that the desirable course lay between these two extremes. Thus, while it is desirable to have national policies where feasible, the committee believes water problems can be solved best in cooperation with the States and local interests. Sound procedure requires that all interested groups participate in planning from the beginning, Morse emphasized.

Recommendations

After reviewing the activities of the Federal agencies, their histories, and the laws under which they operate, Morse said the committee offered these recommendations:

1. More cooperation and coordination of water resources development among Federal agencies.
2. Adaptation of water resources policy to regional and local needs.
3. Sharing of financial responsibility for water development among Federal, State, and local governments, and private interests.
4. Equal contribution for equal benefits received.
5. Recognition of water rights as property rights in determining the disposition of water.
6. State control of pollution at the source; joint State action in solving interstate problems; and Federal research, investigation, and technical assistance.

The committee urged that the program of water quality evaluation be strengthened. Today there is no coordinated program for measuring biological quality, and there are only 220 stations throughout the country where daily samples for determination of chemical quality are taken, Morse reported.

Only in recent years, he said, has adequate attention been given to municipal and industrial water supplies or the provision of minimum stream-flow for pollution control. Individual cities and private companies have made their separate plans, often with little thought for the effect on other people, utilities, or industries. As a consequence, these features of multipurpose projects have not received the attention they deserve.

To meet the need for sound planning, the committee recommended the establishment of river basin committees including representatives of the Federal agencies and each affected State, with a nonvoting chairman appointed by the President; an office of coordinator of water resources in the Executive Office of the President; and an impartial board of review for evaluating the economic and engineering feasibility of projects before their submittal to the President.

The committee, Morse said, also recommended a study by the Federal Government in collaboration with the States to determine the relationship between the establishment of property rights to water and the economic and social development of the Nation. Such a study would clarify the rights of the respective parties, an essential to solving the current dilemma in this field.

San Francisco Intensifies Air Pollution Control

Determined to control present and future air pollution as the concentration of people and their activities increase, the San Francisco Bay area has embarked on a program of air pollution control that necessi-

tates extensive integration with many types of government agencies at several levels—city, county, State, and Federal.

Designing the administrative and technical program for the first multi-county air pollution control district in the United States is the job of Benjamin Linsky, former smoke abatement officer for Detroit.

Linsky urged prompt action by communitywide cooperation. Fresh air has to be paid for in money and effort, he said.

In his talk to the Conference of Municipal Public Health Engineers, he opposed previous impressions that air pollution programs can be handled, like industrial hygiene, on a confidential relationship with employers only, or like water pollution control, where only a few agencies, industries, or home owners are directly responsible, or like traffic safety programs, where few drivers feel personally vulnerable.

Asked to explain why he believes administration of air pollution control differs from all other programs for public improvement, Linsky gave the following reasons.

1. The range of ownership of potentially polluting property is wide. It includes owners of factories, automobiles, homes, apartment homes, and of general commercial enterprises plus transportation companies, agriculturalists, scavengers, scrap and salvage processors, and government agencies.

2. The number of property and equipment items that emit pollutants directly to the atmosphere is about as large as the number of adults in the area. (This means 1 home plus 1 car for every 2 adults per family, modified downward by multiple dwellings and upward by governmental and commercial industrial operations and increased automobile duplication, he said.)

3. Many effects of excessive air pollutant concentrations are readily observed by large numbers of adults, who are directly affected in their person, property, or activity, but the subtle effects arouse their fears be-

cause they are not so readily detected.

4. The similarities of some of the technical measurement methods to those of other programs have led practitioners trained in other fields to conclude that the new administrative problems are solvable by the old familiar methods.

5. The many academic and scientific disciplines in air pollution control have not been welded into an accepted pattern of terminology, education, or training other than the "buddy" system, a combination of apprenticeship and internship.

6. The patterns of legislative design are not frozen for multiple community areas, enforcement and rule-making procedures, or technical methods to be adopted.

7. Present budgetary need can only be approximated by comparison with tasks and budgets of other air pollution control programs. The wide difference in community standards, tasks performed, and administrative philosophies, ranging from pure persuasion to rigorous court enforcement, makes skill and judgment necessary.

Typhoid Outbreak Source Eludes Investigators

The typhoid fever outbreak in the midwest in 1956 should alert sanitarians to the need for increased vigilance in food sanitation, declared Frank L. Woodward of the Minnesota Department of Health.

If there was a common source of infection in this outbreak, in which at least 6 midwestern States were affected, it must have been some food with interstate distribution, he maintained.

Intensive epidemiological investigation failed to find a "single most likely source," he said, but the evidence, he believes, points to contaminated food shipped interstate. This conclusion is his own, drawn from incomplete, unofficial memorandums, not necessarily that of the investigators, he stated.

Unlike most disease outbreaks, there was no immediate evidence of a relationship between any two of the cases, according to Woodward. There were no two cases in a family or among acquaintances and no common point of assembly, he said. There were no multiple primary cases and apparently no secondary cases.

To illustrate how various factors influence the course of an investigation as an outbreak progresses, he outlined developments in Wisconsin, Iowa, and Minnesota from January through mid-July.

Since the first cases occurred in early January, Woodward said, Christmas-season foods were first considered as a possible source of the infection—chocolated-covered cherries, a hand-finished product, for example. But as new unrelated cases developed in February and March, attention was directed to all foods.

Woodward considers it a likely possibility that a particular food was continuing to be contaminated, probably intermittently, throughout the period. This concept, he said, suggests, among other items, fresh vegetables, such as lettuce and celery.

The outbreak furnishes a challenge to all persons responsible for sanitary control of food production, processing, and marketing, Woodward concluded. Food ingredients as well as finished food and even wrappers and containers require scrutiny, he said.

High Free Residual Chlorine Effective for Pool Waters

The use of high free residual chlorine in swimming pools disposes of the need for standard bacterial tests, according to Dr. Elizabeth D. Robinson and Louise R. Elliot of Smith College, and Eric W. Mood of Yale University.

Tests conducted on samples from four swimming pools under varying conditions show that high free re-

sidual chlorination produces water free of pathogenic bacteria. If accurate titrations of the chlorine residuals are carried out routinely, they stated, bacterial standards need not be used to determine the safety of swimming pool water.

This new concept grew out of a search for a procedure that would keep pace with the latest developments in swimming pool water treatment. "Accepted bacterial tests," they said, "are not sufficiently delicate or precise to determine the relatively few organisms which survive high free residual chlorination."

Such chlorination, a relatively new treatment in the United States, is effective even during peak swimming loads and is easy to maintain. Also, they pointed out, free chlorine residuals eliminate the chance that a swimming pool will transmit bacterial disease. Levels of chlorination can be almost immediately ascertained, but bacterial tests may take 48 hours or more.

Claims Dishwashing Devices Remove Sticky Viruses

Home dishwashing machines maintained at the recommended water temperature of 150° F., or above, effectively and consistently removed all detectable influenza A, mumps, herpes simplex, vaccinia, poliomyelitis, and T₁ bacteriophage viruses from dishes excessively contaminated in the laboratory, according to studies reported by Dr. S. Stephen Chapman and Barbara Vinsel of the School of Medicine, University of Louisville.

A sensitive swab technique for detecting viruses on dishes was developed. It was found, using this method, that influenza A, herpes simplex, and mumps viruses remain viable on soiled dishes for at least 24 hours.

Chapman and Vinsel claimed that influenza and mumps viruses were not effectively removed by the usual home, hand-dishwashing manner, stating that the success of viral

elimination was quite variable, however fastidious the person washing the dishes.

Optimal sanitizing of viral-contaminated dishes resulted when water temperatures of multiple-rinse home dishwashers were 150° F. and above. Detergents added in both prerinse and wash cycles promoted quickest removal of the viruses. It was apparent that certain basic dishwasher design features were important for rapid virus removal.

Sanitation, Water Supply Stressed by India

Projects to improve India's water supply and sanitation have been given priority since they are vital to the success of the new republic's broad health program, reported Callis H. Atkins, regional engineer, Public Health Service. He served with the U. S. Technical Cooperation Administration as adviser in public health engineering to the Indian Government from 1952 to mid-1955.

Each year, in the 10 years ending in 1950, about 2 million persons died and 50 million became ill from diseases borne by water and filth, according to an estimate cited by Atkins.

A survey in 1949 by a committee appointed by the Ministry of Health attests to the huge tasks facing India. Only 16 percent of the towns had protected water for 6 percent of the population. The percentage for villages was even lower. There were sewers in 23 cities out of 48 with populations of 100,000 and over. In the villages, less than 5 percent of the homes had any kind of latrines.

Project Planning

Impetus for the environmental health projects came, Atkins pointed out, during India's first 5-year plan, which was designed for comprehensive development of the country's social and economic resources. Health projects were set up in se-

lected areas under the Community Projects Administration.

A survey disclosed that there were 50 engineers with graduate training in public health or sanitary engineering. There was no sanitary engineering or public health engineering unit in the national government, although a few states had small organizations. Local production of sanitation equipment was insufficient, making importation necessary.

Funds allocated to the Community Projects Administration for water and sewerage were small, but some states had limited amounts for that purpose. At this point, Atkins said, the Technical Cooperation Administration offered its assistance, and the United Nations International Children's Emergency Fund and the World Health Organization showed interest in taking part.

Operation of the Projects

In August and September 1954, India announced it would aid its states in building water supply and sanitation facilities. About \$13 million was offered for passing on as loans to municipalities within 1½ years, but 6 months later the fund had increased to \$42 million, allocated to about 250 municipal projects.

For rural work about \$6½ million were first channeled to the states on a matching basis. This rose to more than \$13 million, a large share being distributed to approximately 100 projects in about 10 thousand villages during the first year. Assistance from the Technical Cooperation Administration, representing 5 percent of total cost, was in Atkins' opinion the catalytic agent in the program's development.

Research and training in water supply and sanitation were accelerated and the scope broadened through the cooperation of the Ford Foundation, the World Health Organization, the Rockefeller Foundation, and the Technical Cooperation Administration.

When possible, equipment and

materials were purchased locally to stimulate the country's industry. Indian production of cast iron pipe rose to about 50,000 tons a year, Atkins pointed out, over half the quantity needed. With TCA funds, a large number of trucks, jeeps, pumps, and some engineering equipment were imported.

Public health engineering sections were organized in the Central Ministry of Health and in many states previously without such units. The states in turn charged new district engineer offices and resident engineers in the municipalities with all urban work; for rural operations, the state appointed a public health engineer to head a technical staff for each project. Staff duties included health education and construction of water supplies and latrines. After completion of the project, one sanitarian was to remain for maintenance and general sanitation.

In May 1955 India was looking forward to the fulfillment of 250 urban projects scattered through 17

states, and 100 rural projects in 16 states.

Atkins said that extension of the program is planned under the second 5-year plan beginning in 1956, under which about \$135 million has been earmarked for city water supply and sewerage loans, and \$62 million for rural projects. The new plan includes funds for training 1,000 engineers, 200 chemists and biologists, and 5,000 sanitarians and allied personnel; as well as funds to support research programs.

In Atkins' opinion the present and projected programs should satisfy major municipal needs in about 25 years, and rural requirements in 50 years if economic conditions remain at the 1955 level. It may well be, however, that simultaneous advances in all phases of the resources development program will cause "geometrical instead of arithmetical progress," bringing India considerably closer to her goal of safe water supplies and a high level of sanitation.

Radiological Health . . .

Data on Radiation Injury Sought for Standards

Plans to expand Public Health Service activities in radiological health were announced by Dr. Clinton C. Powell, who is developing for the Service a program on the medical aspects of radiation.

Parallel to broad environmental control, which is also being expanded, the Service will undertake epidemiological investigation of the quantitative aspects of low-level radiation hazards and other medical research.

To set realistic, yet safe, standards, Powell said, scientists need much more data, especially for humans, on the amount of radiation injury occurring in the population.

Genetic effects, increased inci-

dence of neoplasms, including leukemia, and premature aging must be considered in establishing radiation exposure standards.

Experience to date, Powell reported, indicates that harmful effects of chronic low-level radiation exposures will be delayed for years, or even generations. Since most of these harmful effects will probably be no different qualitatively from disease conditions already present in the population, we must study statistically the incidence of these conditions in exposed and unexposed groups if we are to detect any increase resulting from radiation exposures.

Genetic mutations, he said, are irreversible and have no threshold for their production. Furthermore, the total number of mutations will be

the same for a small dose delivered to a large number of persons as for a large dose delivered to a small number. Thus, a radiation dose must be reduced in direct proportion to the number of reproductive persons involved if the total genetic consequences are to remain constant.

Therapeutic Doses

In the healing arts, he said, there has been an increasing awareness of the possible risk to the patient in diagnostic and therapeutic medical uses of ionizing radiation.

Exposures that might have been acceptable if no other environmental exposure were added now require reevaluation in the light of the total actual and potential exposure that the entire population may receive.

Powell pointed out that a fixed or arbitrary limit on medical radiation exposures would be unrealistic. Circumstances vary so widely in each individual case that the decision in each case must rest with the practitioner. However, he said, the information available to date does not allow the practitioner to make a firm estimate of the possible hazard.

Terming it axiomatic that any exposure should be reduced to the lowest level consistent with good diagnosis or therapy, he designated three immediate measures in equipment and operation, if they are not already employed.

Proper added filtration, he said, collimation of the beam by the use of proper cones, and use of optimal factors, such as higher kilovoltages, can reduce the dose to the patient in many instances and at the same time actually improve the diagnostic quality of the study.

Measuring Radioactivity In Water and Soil

Practical procedures for determining the gross alpha and beta radioactivity of water, soil, and biological samples were presented by Dr. Lloyd R. Setter, G. Richard Hagee, and Dr. Conrad P. Straub of the

Robert A. Taft Sanitary Engineering Center, Public Health Service.

The procedures described have applied to surface and ground water throughout the United States during the past 6 years.

They consist of separating the suspended activity by filtration and evaporating the filtrate. The filter and concentrated filtrate samples are placed in separate dishes 2 inches in diameter and dried at 103° C. or ignited at 600° C.

The samples are inserted in a radiation detector called an "internal proportional counter." The detector consists of a methane-argon gas counting chamber, a preamplifier, an electronic scaler, and power supply assembly. For detection, the radiation escapes from the sample, enters into the sensitive volume of the counting chamber, and ionizes the counting gas. The scaler totals the ionization events occurring during a selected time interval.

The detectors have a maximum efficiency of about 50 percent for alpha and 65 percent for beta activity from 1-year-old fission products.

The methods used are suitable for estimating nonvolatile radioactivity at levels below 100 micromicrocuries per liter, the maximum permissible concentration of unknown radionuclides in drinking water. They are applicable at levels exceeding 100

µµc. per liter and may, through decay measurements or a knowledge of radionuclide composition, indicate the health significance of observed activity.

Methods of identifying and determining radionuclides absorbed by soil were described by Bernd Kahn, chief chemical engineer of Sanitary Engineering Center Activities at the Oak Ridge National Laboratory.

Radionuclides are either leached from soil or dissolved with the soil, then separated and purified by radiochemical procedures, and counted with a radiation detector that has been calibrated for counting efficiency.

Kahn presented the leaching procedures for radiocobalt and for radionuclides of the major fission products cesium, strontium, cerium, yttrium, zirconium, niobium, and ruthenium.

He reported that these methods of soil analysis have been largely confined to Atomic Energy Commission installations because of widespread unfamiliarity with radiochemistry. But their similarity to common chemical analyses should broaden their use.

The increased distribution of radionuclides by fallout and by waste discharges has created the need to study the behavior of radionuclides in the environment, he said.

Communicable Diseases . . .

Strep Carrier Rates High In Nashville Children

In view of the scarcity of epidemiological data on streptococcal infections in civilian populations, Drs. Robert W. Quinn, Floyd W. Denny, and Harris D. Riley are studying preadolescent children in three Nashville, Tenn., public schools.

They report extremely high car-

rier rates of hemolytic streptococci for the children, all normal third and fourth graders, during the first 2 years of study.

Dr. Quinn and Dr. Denny, professors of preventive medicine at Vanderbilt and Western Reserve Universities, respectively, and Dr. Riley, instructor in pediatrics at Vanderbilt, reported the following:

Group A streptococci composed 84 percent of all streptococci recovered.

Fifty-two percent of these strains were typable.

The schools selected for study are in differing socioeconomic areas. Children in one school come from relatively spacious homes where the educational attainments are higher and heating and toilet facilities are better. Carrier rates for this school reached 60 and 42 percent for the study years, 1953-54 and 1954-55.

In the two schools drawing from poorer environments, the rates were not so high, 45 and 26 percent in one, and 41 and 30 percent in the school serving an inferior area.

Possible explanations for the high carrier rates and their differences in the schools and between study years were explored. Meteorological conditions in Nashville were ruled out. And neither environmental factors in the schoolrooms nor in the homes seemed to affect the carrier rates directly. In noting that the presence or absence of tonsils among the children had little apparent effect on the carrier rates, they concluded that more data are needed on this particular characteristic.

Psittacosis a Health Hazard in Oregon Poultry Industry

Psittacosis is increasing in importance as a hazard to poultry workers on farms, in rendering and processing plants, and in poultry marketing facilities, according to Dr. Harold M. Erickson, Oregon State Health Officer, and his associates, Dr. Samuel B. Osgood and Dr. Monroe A. Holmes. They feel that its occurrence in poultry may be of equal or even greater significance to man than the infection in psittacine birds.

In 1956, 86 persons, 27.8 percent of the 309 workers exposed to infected turkeys, became ill with psittacosis in Oregon, Erickson reported. Twenty-eight required hospitalization and two died. Five worked on farms, and the remaining 81 were employed in processing and marketing operations.

How the disease is transmitted in poultry, particularly turkeys, is not known, Erickson stated, but it may be airborne. In a rendering plant, aerosol studies demonstrated tracer bacteria in air samples collected both inside and outside the plant; in a processing plant, inspectors and other workers, as well as those defeathering and eviscerating birds, became ill.

He suggested precautions to minimize the danger of contracting psittacosis. These included antemortem veterinary inspection of all birds, elimination of sick birds from flocks, quarantining of flocks with suggestive symptoms, treatment of infected flocks with tetracycline compounds, strict environmental control in processing plants, postmortem veterinary inspection and condemnation of suspicious birds, rigid personal hygiene and use of rubber gloves and masks by poultry workers, and prompt medical attention to unusual respiratory or pneumonia-like illness in poultry workers.

Erickson stressed the need for research. Until the disease in poultry flocks can be recognized early and controlled promptly, it will be of real significance in occupational health. Psittacosis is also of sufficient economic importance to warrant large expenditures for research and epidemiological investigations, as well as for environmental control, he said.

Texas Q Fever Study Finds Ticks Negative

In an enzootic and endemic area, tests for Q fever vectors among ticks and other arthropods were negative, according to Drs. J. V. Irons, R. B. Eads, and J. E. Peavy, of the Texas State Health Department.

The finding was part of a study covering 64 confirmed human cases and infection in 8 dairies in south Texas in the period from September 1948 through December 1955. The majority of Q fever cases occurred in men living on farms or in towns in southern Texas, where most of the

livestock infection was also centered. Circumstances pointed to cattle as the most probable infection source, they concluded, sheep and goats being of minor importance. The search for possible modes of transmission pointed to the drinking of raw milk or inhaling the dust near cattle trucks, barns, and pens.

For diagnosis of the 64 cases, clinical, epidemiological, and laboratory findings were used. The complement fixation test was the most valuable as a diagnostic and epidemiological aid.

The concentration of Q fever in south Texas, mainly in Kleberg and adjacent counties, and the failure to find the causative agent, *Coxiella burnetii*, in many pools of ticks in that area indicate a need for further investigation.

New Bovine Viral Agents Isolated in Michigan

Eight strains of a filterable, cytopathogenic agent were isolated from 52 apparently healthy dairy cattle in Michigan, reported Dr. Calvin M. Kunin of Peter Bent Brigham Hospital in Boston, Mass., and Elva Minuse of the School of Public Health, University of Michigan.

The strains, which are related serologically, do not resemble other human or bovine agents studied.

Cattle kidney tissue culture was the medium used for isolation, which was accomplished, they said, with relative ease. The group of strains was tentatively designated ECBO (enteric, cytopathogenic, bovine, orphan) because their isolation strikingly parallels that of the Coxsackie and ECHO viruses from healthy humans.

The agent produces lesions and multiplies in tissue culture, suckling mice, and chick embryos. When grown in the amniotic sac of 10- to 11-day-old Barred Rock eggs, the agent dwarfed the embryo, denuded the feathers, and released melanin granules into the amniotic fluid.

Antibodies to the agent were not

the same for a small dose delivered to a large number of persons as for a large dose delivered to a small number. Thus, a radiation dose must be reduced in direct proportion to the number of reproductive persons involved if the total genetic consequences are to remain constant.

Therapeutic Doses

In the healing arts, he said, there has been an increasing awareness of the possible risk to the patient in diagnostic and therapeutic medical uses of ionizing radiation.

Exposures that might have been acceptable if no other environmental exposure were added now require re-evaluation in the light of the total actual and potential exposure that the entire population may receive.

Powell pointed out that a fixed or arbitrary limit on medical radiation exposures would be unrealistic. Circumstances vary so widely in each individual case that the decision in each case must rest with the practitioner. However, he said, the information available to date does not allow the practitioner to make a firm estimate of the possible hazard.

Terming it axiomatic that any exposure should be reduced to the lowest level consistent with good diagnosis or therapy, he designated three immediate measures in equipment and operation, if they are not already employed.

Proper added filtration, he said, collimation of the beam by the use of proper cones, and use of optimal factors, such as higher kilovoltages, can reduce the dose to the patient in many instances and at the same time actually improve the diagnostic quality of the study.

Measuring Radioactivity In Water and Soil

Practical procedures for determining the gross alpha and beta radioactivity of water, soil, and biological samples were presented by Dr. Lloyd R. Setter, G. Richard Hagee, and Dr. Conrad P. Straub of the

Robert A. Taft Sanitary Engineering Center, Public Health Service.

The procedures described have been applied to surface and ground water throughout the United States during the past 6 years.

They consist of separating the suspended activity by filtration and evaporating the filtrate. The filter and concentrated filtrate samples are placed in separate dishes 2 inches in diameter and dried at 103° C. or ignited at 600° C.

The samples are inserted in a radiation detector called an "internal proportional counter." The detector consists of a methane-argon gas counting chamber, a preamplifier, an electronic scaler, and power supply assembly. For detection, the radiation escapes from the sample, enters into the sensitive volume of the counting chamber, and ionizes the counting gas. The scaler totals the ionization events occurring during a selected time interval.

The detectors have a maximum efficiency of about 50 percent for alpha and 65 percent for beta activity from 1-year-old fission products.

The methods used are suitable for estimating nonvolatile radioactivity at levels below 100 micromicrocuries per liter, the maximum permissible concentration of unknown radionuclides in drinking water. They are applicable at levels exceeding 100

µµc. per liter and may, through decay measurements or a knowledge of radionuclide composition, indicate the health significance of observed activity.

Methods of identifying and determining radionuclides absorbed by soil were described by Bernd Kahn, chief chemical engineer of Sanitary Engineering Center Activities at the Oak Ridge National Laboratory.

Radionuclides are either leached from soil or dissolved with the soil, then separated and purified by radiochemical procedures, and counted with a radiation detector that has been calibrated for counting efficiency.

Kahn presented the leaching procedures for radiocobalt and for radionuclides of the major fission products cesium, strontium, cerium, yttrium, zirconium, niobium, and ruthenium.

He reported that these methods of soil analysis have been largely confined to Atomic Energy Commission installations because of widespread unfamiliarity with radiochemistry. But their similarity to common chemical analyses should broaden their use.

The increased distribution of radionuclides by fallout and by waste discharges has created the need to study the behavior of radionuclides in the environment, he said.

Communicable Diseases . . .

Strep Carrier Rates High In Nashville Children

In view of the scarcity of epidemiological data on streptococcal infections in civilian populations, Drs. Robert W. Quinn, Floyd W. Denny, and Harris D. Riley are studying preadolescent children in three Nashville, Tenn., public schools.

They report extremely high car-

rier rates of hemolytic streptococci for the children, all normal third and fourth graders, during the first 2 years of study.

Dr. Quinn and Dr. Denny, professors of preventive medicine at Vanderbilt and Western Reserve Universities, respectively, and Dr. Riley, instructor in pediatrics at Vanderbilt, reported the following.

Group A streptococci composed 84 percent of all streptococci recovered.

male stomach cancer death rates in Boston, in which "Russian born" males (including those born in Poland) had the highest rates. The report also notes that Buffalo's large Polish population does not explain why a greater proportion of the stomach cancer cases than of the controls were born in Poland, since both stomach cancer and control groups included the same proportion of Buffalo residents.

High Blood Pressure Raises Risk of Heart Attack

Men between 45 and 62 years of age with high blood pressure appear to stand a much greater risk of developing heart attacks than other men, affirmed Drs. Thomas R. Dawber, Felix E. Moore, and George V. Mann, National Heart Institute, Public Health Service.

Other factors which may have a probable relationship are obesity, high blood cholesterol, liver disease, and chronic arthritis, and rheumatism, they said in reporting preliminary findings from data accumulated during the first 4-year followup period in a long-term epidemiological study of heart disease at Framingham, Mass.

The community is being observed over a long period to discover how many people have heart disease, what types they have, when it develops, and what factors seem to be associated with it. More than two-thirds of a random cross section of Framingham residents between 30 and 60 years of age were given a complete, initial physical examination during 1948-52, and are being reexamined at 2-year intervals.

Comprehensive data are recorded on all conditions which medical scientists suspect may be related to the development of heart disease. Comparable data collected from both those who remain free of heart diseases and those who subsequently develop them are then analyzed to disclose what factors may be related to the development of disease.

Fifty-two of 900 men between 45 and 62 years of age developed coronary heart disease during the first 4-year followup period. This limited number permitted only tentative conclusions.

High blood pressure and hypertensive cardiovascular disease were found to be strongly associated with the development of coronary attack. High incidence rates in participants with high blood pressure were closely correlated with electrocardiographic patterns consistent with left ventricular hypertrophy.

Obesity appeared clearly related to the risk of coronary attack. The upper 10 percent of overweight men showed an attack rate three times as great as men whose weight was below the median.

Liver disease appeared to increase the risk of coronary attacks as did the presence of chronic arthritis and rheumatism.

Socioeconomic status seemed to have little relationship to the risk of developing coronary heart disease. Persons with grade school education did not have significantly

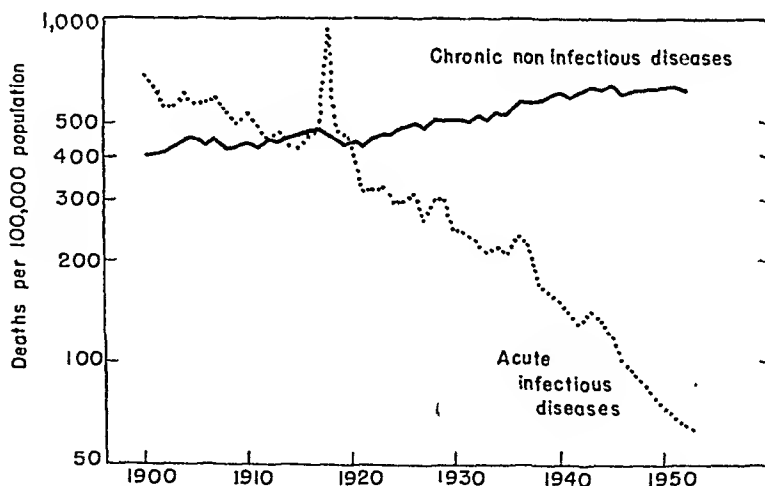
higher rates than the group as a whole.

The incidence of coronary disease showed a correlation between sex differences and amount and severity of disease. A 4-year rate of 12 per 1,000 was observed among men 30 to 44 years of age, while no new cases of disease were found among women in this age group. The 4-year incidence for men 45 to 62 years of age was 58 per 1,000, exactly double that observed among women. Significantly, more than one-fourth of the coronary disease cases among men within the followup period were fatal; most of the deaths occurred suddenly before the patients could be hospitalized.

Limitation of Interviews Noted in Illness Survey

The prevalence of chronic diseases as measured by household interviews and by clinical examinations was compared statistically in the Baltimore chronic disease survey

Deaths from Chronic Diseases Increase



Reported causes of death indicate that fatalities from acute infectious diseases are declining almost to the vanishing point. On the other hand, deaths caused by chronic noninfectious diseases seem to be almost as frequent as those formerly caused by infections. (PHM chart)

observed in human or porcine gamma globulin, nor in serum from three farmers in close contact with the infected herd. Such antibodies were found, however, in 90 percent of the herd from which 7 of the 8 strains were isolated.

They speculated that these findings when considered together with the known neutralizing activity against type 2 poliomyelitis virus present in the serum of many cattle may indicate that poliomyelitis-related viral agents will be isolated in the future by similar methods.

Global Campaign Progress Against Malaria Cited

World malaria incidence has dropped by tens of millions in the last few years under the impact of residual toxicants applied nationwide by many countries, reported Dr. Paul F. Russell of the Rockefeller Foundation. But malaria remains a major global disease, he said, probably causing 200 million clinical cases and 2 million deaths last year.

Thus far, energetic measures have erased the disease from wide areas, and its grip on several once highly malarious countries has been broken. The goal of world malaria eradication is no longer utopian, he stated.

Eradication campaigns have four phases, he explained: the preparatory phase, the phase of attack, the phase of consolidation, and finally, the phase of maintenance.

To illustrate the workability of such campaigns, Russell outlined the eradication process in several countries. In Venezuela, DDT residual spraying has removed the disease from all but a few residual foci; in Italy, malaria incidence dropped from 400,000 in 1945 to 5 in 1955; and in Ceylon, spraying is now needed only for jungle areas being cleared for farmland.

He continued with a review of malaria control and eradication projects assisted by the World Health Organization, the United Nations Children's Fund, the International Cooperation Administration, and the Public Health Service. He felt that international funds and technical aid are still insufficient.

He stressed the need for more malariologists, particularly for research. Further study of unsolved entomological problems, such as vector resistance to insecticides, must parallel forward planning of the malaria drive. Fundamental malaria research in the United States must be vigorously renewed if the millions of dollars invested in overseas malaria control are to be protected and global eradication of malaria accomplished.

tients with cancer or nontumorous conditions of other sites.

Significant associations found between occupation and gastric cancer involved exposure to iron dust in metal industries and exposure to inorganic dust with free silica (sand) encountered in such occupations as coal miner and pick and shovel operator in road construction. The investigators noted the similarity between these findings and those of an earlier team of investigators who found an excessive liability to gastric cancer among iron, coal, and slate miners.

The association between gastric cancer and exposure to iron dust became stronger with an increase in the probable duration and concentration of exposure, it was stated. Thirteen percent of the patients with stomach cancer and only 1 percent of the controls had been exposed to iron dust for 10 or more years while working as craftsmen, foremen, operatives, or laborers in blast furnaces, steel works, rolling mills, and various metal manufacturing industries, with the duties including at least 3 years of exposure at probable high concentration. Another 18 percent of stomach cancer patients and 8 percent of controls had been exposed to inorganic dust with free silica for 10 or more years.

These associations between gastric cancer and occupation were found to be independent of the factors of smoking, age, race, marital status, population of place of residence, and (probably) socioeconomic status.

It was also observed that 23 percent of all of the stomach cancer patients had been born in Poland, against 6 percent of the control group. The report suggests that the occupational and nativity associations with gastric cancer were independent of each other and that the factors of Polish birth and occupational exposure to iron dust in the same individuals exert an additive effect.

The finding for Polish births, the report continues, was anticipated in a study by earlier investigators of

Chronic Diseases . . .

Suggest Gastric Cancer Tie To Occupation and Nativity

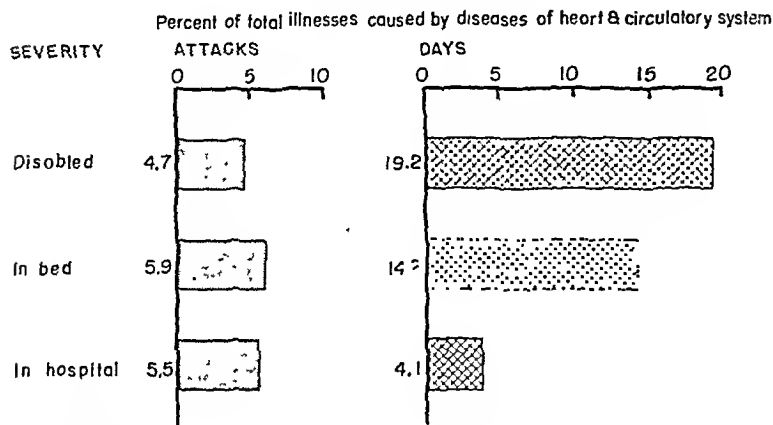
The possibility of etiological links between gastric cancer and occupation and nativity is suggested in a study conducted by the New York State Health Department at Roswell Park Memorial Hospital, Buffalo.

Further testing of the hypotheses is needed, particularly with more

widely representative samples of the disease group and the general population, cautioned Arthur S. Kraus, Dr. Morton L. Levin, and Dr. Paul R. Gerhardt.

In a joint report they described the significant and independent associations between the disease and the two epidemiological variables, revealed in a comparison of the histories of 56 adult males with cancer of the stomach and 677 control pa-

Measures of Morbidity for Cardiovascular Diseases



Although cardiovascular diseases are responsible for only about 5 percent of the attacks of disabling illness, they cause about 19 percent of the days of disability in a white, urban population and account for about 14 percent of days in bed with disabling illness. (PHM chart)

designed to prevent streptococcal infections of the throat.

Physicians are usually quick to initiate antibiotic therapy for even a suspected streptococcal infection, Berliner remarked, but he said they may need laboratory evidence of the infection to justify continuance of treatment for the time required to prevent rheumatic fever. Thus, it is necessary for physicians to have available to them the means of obtaining accurate and inexpensive throat cultures, he declared. He considers the "provision of the means" a challenge of outstanding importance to public health laboratories.

Need for Chronic Disease Programs Reported

The question of whether the future of sound health department practice in the chronic disease field lies in programs of health promotion, disease prevention, treatment, and rehabilitation rather than in services developed according to disease categories, was raised by Dr. Jonas N. Muller, director, depart-

ment of preventive medicine, New York Medical College, and Edward B. Kovar of the United Community Service of Metropolitan Boston.

In a survey of 187 local health departments, the Subcommittee on Chronic Disease and Rehabilitation of the APHA Committee on Administrative Practice found few examples of an integrated chronic disease program although these departments provided many and varied services for the prevention and management of chronic disease and disability, Muller reported.

Almost 60 percent of the surveyed departments consider chronic disease activities a major responsibility of the health department. However, all departments provided many services for the prevention or management of chronic disease or disability, Muller said. Departments which are responsible for general medical care programs, hospitals or institutions, or for both have more services or personnel concerned with chronic disease activities than do departments with no such responsibilities, he stated. A few local health departments reported occupational health programs which give special

attention to chronic diseases and disabilities. Fewer than one-third reported promotion of local implant health service in industry.

Over 60 percent of the departments surveyed had made or had assisted in community surveys of chronic disease problems, needs, services, or facilities; many had made special studies. Almost all departments reported some activity which helps to develop, strengthen, and coordinate community chronic disease services, Muller stated.

He said that community educational activities include public information, distribution of educational materials, exhibits, and speeches at public meetings, illustrated by films and other materials. Some health departments help plan professional school curriculums, staff part of the programs, and, through inservice institutes, take part in the postgraduate education of nurses and occasionally of physicians.

Some health departments provide medical consultation to vocational rehabilitation agencies and welfare authorities. Welfare workers, in turn, provide consultation on economic status and welfare problems of health department patients.

Most health departments offer preventive and diagnostic services; some provide treatment services and a few, rehabilitation services, Muller reported. However, departments providing treatment or rehabilitation services, or both, for children and adults or for adults only are greatly outnumbered by those which provide such services for children only, he said.

Simultaneous screening programs for more than one disease are among the chronic disease activities of some local health departments, and a few departments give group instruction in nutrition or obesity control, Muller stated.

Cooperation between health departments and other community agencies was an important finding of the survey, Muller stated. The services of social workers, nutritionists, health educators, psychiatrists,

conducted in 1953-55 by the recently disbanded Commission on Chronic Illness.

Dean E. Krueger, assigned to the survey by the National Heart Institute of the Public Health Service, reported that household interview data grossly understated the prevalence of chronic diseases.

Clinical examinations are recommended rather than household interviews as a method for studying the prevalence of disease, but it was observed that the amount of disability resulting from chronic disease can be measured as well by interview as by any other method.

The Baltimore interviews yielded only one-fourth of the cases of chronic diseases that were diagnosed by subsequent clinical examination, Krueger said. He added that the completeness of household reporting of disease varied widely among diagnostic groups, that there was no difference in completeness of reporting by severity of the case, that no group was identified for which the reporting of diagnosable chronic conditions in interviews was high, and that proof of the reliability of clinical examinations as a means of measuring the prevalence of chronic disease is needed.

"If clinical examinations are to be used more extensively in studies of the prevalence of chronic disease, criteria for diagnosis should be developed which would emphasize the need for uniformity for research purposes without denying the importance of clinical judgments," he commented.

Reasons for the inadequacy of the interview included lack of knowledge of the condition, use of household rather than individual respondents, deliberate withholding of information, differences in concepts of what constitutes disease and symptoms, limitations of the questions asked, language difficulties, and low mentality of some respondents.

Nonreporting in interviews, Krueger continued, reflected people's deeply ingrained attitudes, their social patterns, and capacities which are not amenable to rapid change.

The Baltimore study provides good evidence that, even though some improvement in content and technique of interviewing can be made, the interview is not likely soon to become a valuable tool in measuring the prevalence of diagnosable chronic diseases, he concluded.

Survey methods used in the study included interviews with a sample of 3,700 households having 11,574 members and clinical examinations of 809 individuals from a subsample of 1,202.

The interview questionnaire included both general questions about sickness, injuries, impairments, and chronic conditions, and extensive checklists of chronic diseases and symptoms of disease. Participants in the subsample had their medical history taken by specialists in internal medicine and received a physical examination plus a battery of medical tests.

Laboratories Can Improve Heart Disease Tests

Within the scope of their present functions, public health laboratories can contribute to control of heart diseases by work on certain laboratory tests and procedures now used in diagnosis and management of these diseases, said Dr. Robert W. Berliner and Dr. William H. Stewart of the National Heart Institute, Public Health Service.

Among the tests and procedures Berliner named were cholesterol determination, prothrombin determination, and methods for obtaining laboratory evidence of streptococcal infection. In most instances, what is needed, according to his analysis, are techniques that will permit mass use of the tests.

Cholesterol and Lipoproteins

Emphasizing the importance of cholesterol determinations, Berliner pointed out that a relationship between elevation of plasma cholesterol concentrations and atherosclerosis has been established although the nature of the relationship is yet to

be determined. Also, he said, it is generally assumed that a regimen that reduces the concentrations will favorably influence the course of the disease. Thus, physicians are using the test more and more as an aid in management of atherosclerosis.

But at present cholesterol determinations on the same blood specimen done by various laboratories are not always in agreement, Berliner observed; hence, the need for a reliable, reproducible test. Development of such a test, he said, might require modification of laboratory procedures, establishment and maintenance of standards, and special training for technicians.

It has been suggested that determination of the amount of the low-density lipoproteins may be of unique value in identifying individuals who are developing atherosclerosis, Berliner continued. The most recent evidence, however, does not support this view, and the expensive apparatus needed for this type of analysis does not appear, at this time, to be warranted.

Other Tests and Procedures

Prothrombin determinations are needed for monitoring prothrombin activity and maintaining coagulability of blood within safe limits when anticoagulants are being used for coronary artery disease. Here again, Berliner indicated, what is needed is a completely reliable, reproducible test that can be done routinely on a large scale.

For differential diagnosis of myocardial infarction, a determination of the serum transaminase levels can be helpful. According to Berliner, transaminase determination is now in the transitional stage between use by basic and clinical laboratories and prospective large-scale use by practicing physicians.

The key to prevention of initial attacks of rheumatic fever is prompt and adequate treatment of infections caused by beta hemolytic streptococci. Also, subsequent attacks of rheumatic fever can be forestalled by a program of medication

DENTAL PLAN

ards, he believes that a substantially higher degree of agreement could be obtained with revised standards and improved methods of orienting the observers.

The hospital record, believed by some to be inadequate for evaluation of medical care, proved a reasonably valid basis for such evaluation in this study, Rosenfeld maintained. Furthermore, he said, deficiencies in the record are in themselves serious since the record is the main line of communication among the many individuals concerned with the hospital patient.

This evaluation method also proved fairly sensitive. According to statistical tests of significance, the difference between the two teaching hospitals barely bordered on significance, but the differences between the teaching hospitals and the community hospitals were highly significant.

Rosenfeld suggested that standards similar to those used in this study may have many applications. Most immediately, he said, they could be used for self-evaluation by medical staffs. The approach offers some promise as a method of comparing performance among institutions.

The objective of the research, according to Rosenfeld, is to develop a method of measuring the quality of medical care that will be suitable for evaluating the effects of community organization of health services. Clinical evaluation of quality is more valid than statistical measures, but it is less precise, he pointed out.

ILWU Welfare Fund Gives Dental Care to Children

Provision of dental care by their union has removed financial and most other deterrents to visits to the dentist by children of longshoremen in the Pacific Coast States, stated Goldie Krantz, secretary of the International Longshoremen's and Warehousemen's Union and the Pa-

cific Maritime Association Welfare Fund, San Francisco.

Beginning in the fall of 1954, pilot dental care programs were set up in a number of Pacific coast ports, with the advice and assistance of the dental profession, Krantz reported. A service plan provided almost complete dental care for a year. Under an indemnification plan, a charge was made for each service. The plans used both closed and open panels of dentists. The open panel included all dentists who were members of the American Dental Association. Both plans excluded orthodontia, cosmetic care, and dental care provided under the union's health program, Krantz said. In Oregon and Washington, bridgework, space maintainers, and topical fluoride treatment also were excluded.

The ILWU-PMA Welfare Fund sponsored both plans in California. In Oregon and Washington, the indemnification plan was sponsored by the fund; service plans were set up by the State dental societies for the fund.

Children were enrolled at local unions in the plan of the parents' choice. The number of children enrolled were:

| Area | Service plan | Indemnification plan |
|------------------------|--------------|----------------------|
| California: | | |
| San Francisco--- | 1,795 | 1,447 |
| Wilmington Harbor----- | 1,843 | 1,108 |
| Oregon----- | 1,666 | 22 |
| Washington----- | 1,949 | 127 |

Costs of Care

Costs for complete dental care were based on results of a sample study of the children. A schedule of fees determined the maximum amount to be paid for a given service. Payments by the union to the service plan were made only for children seen by a dentist rather than for children enrolled, Krantz said. However, the dental profession, the service plan, and the trustees of the welfare fund combined

their efforts to get children to a dentist.

An insurance company acted as agent for the welfare fund in paying the dentists. A deposit premium and an accident premium were paid for each child enrolled plus a percentage of the total premiums to cover the administrative cost of handling claims. Any part of the deposit premium not spent for services at the end of the year was returned to the fund, Krantz stated.

Costs were reviewed and audits certified quarterly. Under the service plan, costs could be renegotiated every 4 months; if needs had been greater than anticipated, the union would either pay a larger deposit premium or would reduce the services contracted for. Under the indemnification plan, it was not necessary to renegotiate the deposit premium during the year. During the first year of the program, \$630,000 was spent by the welfare fund for dental care for children of union members. No decrease in services nor increase in fees was necessary, Krantz said.

Utilization of Services

Based on 12 months' operation, the percentages of utilization of dental services for children from birth through 14 years of age were:

| Area | Service plan | Indemnification plan |
|------------------------|--------------|----------------------|
| California: | | |
| San Francisco--- | 80 | 65 |
| Wilmington Harbor----- | 90 | 59 |
| Small ports----- | ----- | 51 |
| Oregon----- | 76 | 77 |
| Washington----- | 78 | 58 |
| All areas---- | 81 | 62 |

Evaluation and Education

A dental advisory board made up of the dean of a dental school, a public health dental officer, and a member of the committee on dental care of the California Dental Association checked the quality of care furnished under the program. All

psychologists, and physical or occupational therapists who were employed by agencies other than the health department were available to public health nurses. A few local health departments assist community individual care programs through grants and other forms of financial aid and provide equipment,

supplies, and prosthetic devices to other agencies, he said.

In closing, Muller emphasized that efforts to reduce the burden of chronic disease are fully justified but that much information is needed "before the programmatic concept can be applied more generally to developing chronic disease services."

an effort to make the contingency conform to the insurance rather than the insurance serve the contingency. Also, its introduction may hasten more complete coverage and more inclusive benefits in competing plans, he said.

Still unsolved, he said, are many basic questions concerning benefits, rates, and valid controls to prevent unwarranted inflation in health service costs. Costs to the insuring firm can be cut through use of deductible and co-insurance provisions, Pollack said, but their impact is little understood, he added.

Major medical insurance may in time become a catastrophe rider, with or without deductible or co-insurance clauses, in improved basic plans, Pollack believes. In his opinion, it is not now a satisfactory replacement for basic coverage. "The dilemma is that the only alternative plans available to most people also have serious gaps and deficiencies," he concluded.

Medical Care . . .

Major Expense Insurance Raises Basic Issues

By challenging the fundamental concepts on which voluntary health insurance was grounded and by forcing a reappraisal of health insurance objectives, major medical expense insurance has become a critical issue in insurance circles, according to Jerome Pollack, social security consultant, United Automobile Workers.

This significant new form of health insurance, Pollack explained, requires the insured to assume the full cost of a segment of health care, the first \$100, for example, in medical expenses before major expenses begin. Thereafter, it offers reimbursement for most of the cost of a broad spectrum of health services up to a maximum amount, typically, \$5,000 or \$10,000. The broad range of services includes hospital and medical care, private nursing, drugs, and medicines.

The insurance is based on three fundamental premises: If minor expenditures are not insured, more can be spent for protection against major illness. Small claims should wherever possible not be insured because their handling is too expensive for the benefit derived. If the insured is made to share directly in the cost of the services he receives, he will be motivated to purchase care economically.

Opponents of this insurance fear

that it will misdirect and critically inflate the cost of health insurance, that it creates economic pressures which fall unequally on subscribers, that it would emphasize economic rather than medical considerations for developing health services, and that it abandons preventive care as a covered benefit.

The issues raised set reimbursement against direct service; partial against full payment, and standby rainy day coverage for financial emergencies against full coverage of everyday health care.

Pollack described the issues created by this form of insurance, offered judgments supported by new data, and analyzed the basic precepts, with implications of concern not only to organized labor but also to employers and insurance companies.

"Major medical insurance is an attempt to design an appealing arch without a foundation," Pollack stated. "It may prove to have specialized value for people in the upper income categories who have greater need for financial protection against excessive costs than for general prepayment. But persons with lower income will probably continue to need coverage extending far into minor care, even if this amounts to prepayment rather than insurance."

This move to extend coverage is not a panacea for the ills of health insurance, Pollack indicated. He regards it as a bid for preeminence in the health insurance market, and as

Tests Method for Rating Medical Management

By using written standards in analyzing hospital case records, independent observers can achieve reasonable agreement in rating quality of medical care, stated Dr. Leonard S. Rosenfeld, director of the medical care evaluation studies, United Community Services of Metropolitan Boston.

The method was tried in 2 teaching hospitals and 2 community hospitals. Each item of medical care in selected case records was rated "good," "fair," or "poor," on the basis of written standards, and total ratings for each medical specialty were obtained according to prescribed procedures.

Agreement between pairs of observers working independently was better than random although less than perfect, Rosenfeld said. Since many of the differences in ratings were attributable to situations not covered adequately by the stand-

now fully occupied only at peak hours, not for the half or full day. Half of the benches have been removed altogether. Patients no longer complain about long periods of waiting or show other signs of irritation. Physicians and nurses are relieved of pressure. Clinic administration has been simplified by the spreading of the load.

Lee recommends that other hospitals follow suit in reappraising and relocating services. He would avoid fragmentation of care, another defect in outpatient clinic services, by having each patient treated by the same physician, then followed through a continuous system of recorded medical and social information that can be extended, eventually, to communitywide medical care.

Physicians' Views Influence Relationship With Patients

Physicians' tendency to underestimate patients' level of medical knowledge is one reason why physicians give their patients little information about their condition, according to a report by Drs. Lois Pratt, Arthur Seligman, and George Reader of Cornell University Medical College.

In a study of physician-patient interaction in a large metropolitan outpatient clinic, Pratt stated, 81 percent of 89 physicians underestimated the level of medical knowledge of the clinic patients. Such physicians tended to have less discussion with patients than did others.

Analysis of 50 physician-patient relationships showed that most of the patients were told only a few isolated facts about their condition, Pratt observed. The physicians were more likely to avoid completely discussion of the etiology and prognosis than of such immediately practical matters as tests and treatment.

At the same time, the physicians felt that the patients ought to have a considerable fund of medical information, much more in fact than they actually did have, she pointed

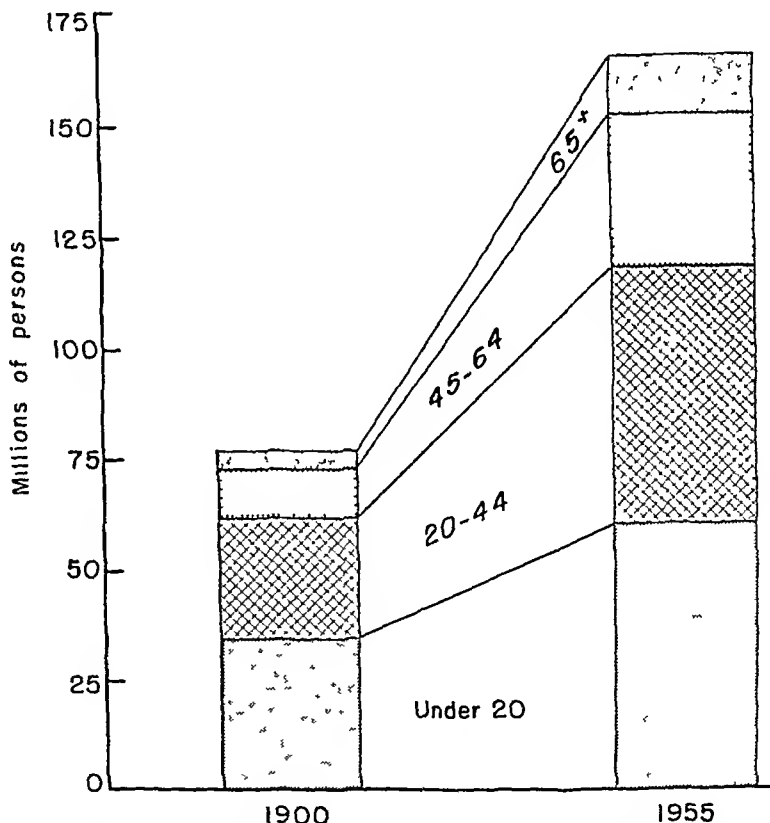
out. On a test of 36 routine questions about 10 common diseases, the physicians thought the patients should know the answers to 82 percent, but the patients actually answered correctly only 55 percent.

Also undoubtedly related to the limited discussion between physicians and patients, Pratt said, are the patients' actual low level of medical knowledge and their lack of overt interest in receiving information. The 50 patients studied gave little evidence of conscious, aggressive demand for information from

the physicians although the majority appeared to have an unformulated, latent desire for information.

The dynamics of the situation are something like this, the study has indicated: When a physician believes his patient to be rather poorly informed, he considers the tremendous difficulties of translating his knowledge into language the patient can understand, along with the dangers of frightening the patient, and decides to avoid elaborate explanations. The patient, in turn, reacts dully to this limited information,

Aging Population



In a 1955 population of 165 million, persons aged 65 and over comprise less than 10 percent of the total. Although their numbers increased from 3 million in 1900 to 14 million in 1955, the percentage of those 65 and over rose only from 4.1 in 1900 to 8.6 in 1955. The proportion of the aged appears likely to gain a little in the succeeding decade. (PHM chart)

information on the plan sent to ILWU families and all publicly were agreed upon by the trustees of the fund, the dental societies, and the insurance company.

The dental societies provided speakers for family meetings, sent letters encouraging appointments to each child and letters to dentists clarifying misunderstandings regarding fee schedules. The importance of these contributions to the program cannot be overestimated, Krantz said.

Beginning in July 1956, the dental care program was extended for a full year. In some areas, this meant an extension of 21 months beyond the pilot year, she stated. A quantitative study of the results of the first year of the program is in progress and a report will be available next spring.

Offers Plan for Promoting Family Health Services

The growing significance of industrial health services to the family is intimated in the paper presented by Dr. Harold J. Magnuson, chief of the Occupational Health Program of the Public Health Service, who offers a tip for alerting health departments.

Industrial health services become family centered as families move into industry-centered communities, Magnuson pointed out, where industrial plants are the focal point of social activities and other enterprises requiring cooperative group action.

Even though the contributions of industrial medicine to society are already considerable, their influence is increasing. Some of the factors aiding this development, he said, are the numbers of women in the work force, the mobility and high educational level of the American worker, and the changing character of industrial hazards.

Occupational hazards endangered family health in the past only in isolated instances, Magnuson stated,

observing that the major threat revolved about infectious diseases, such as tuberculosis, which might be brought to the home.

The industry of the future, with its emphasis on automation, electronic and chemical operations, and nuclear energy, will introduce a new dimension in health problems, having potentially far-reaching effects, Magnuson noted. An example, he added, is ionizing radiation which, unless adequately controlled, may affect unborn generations in the families of exposed workers.

The trend in industrial health programs is toward anticipation of disease as well as prevention, he observed. Industrial and commercial establishments, sensitive to the needs of employees, are willing to spend far more on health security than the public health department is able to spend, he continued.

Formerly limited to preemployment examinations, traumatic surgery, and compensation medicine, industrial health programs have stepped up their services, Magnuson indicated, and now offer preplacement examinations, periodic health examinations, and health education and counseling services.

The preplacement examinations are devised to match the worker to the job and to safeguard his health. The periodic examinations prove particularly useful in the detection of nonoccupational disabilities. And the other services are augmented by referrals to appropriate community health and social resources.

Remarking that these gains have been limited to large industries, Magnuson noted that some small establishments have been able to overcome the financial obstacles to similar services only by such devices as banding with other plants. Various plans of such cooperation have evolved over the past 15 years, he said.

He recommended that health departments seize this opportunity to work with industry in developing a "tailor-made plan" that can be adapted to any group of small industries.

By working through industry-centered communities, the health department can add immeasurably to its own resources in the prevention and control of chronic and degenerative disease, he pointed out. The health department, he said, would in effect thus establish numerous branch offices devoted to adult health promotion.

Outpatient Department Tries New System

By coordinating clinic services and instituting regularly scheduled appointments, Boston's Beth Israel Hospital has overcome several defects in outpatient care, according to Dr. Sidney S. Lee, assistant director.

Until 2 years ago, a typical diabetic outpatient at Beth Israel consumed almost 4 hours per clinic visit. Lee reported. The patient was seen by the physician in the diabetic clinic on the first floor, by the nutritionist in the food clinic in the basement, then by the chiropodist on the second floor.

From there he was directed to the social worker on the third floor and out of the hospital by way of the pharmacy on the first floor. His time, often at a financial loss, was thus consumed in waiting and travel.

Relocation of the chiropodist, the nutritionist, and the social worker in the clinic adjacent to the physician and laboratory has reduced the diabetic patient's time in the clinic to 45 minutes, Lee reported.

The new arrangement makes it possible to resolve conflicting opinions on the spot rather than merely to enter them in the patient's record. The number of visits has been reduced for each patient.

The appointment system established 3 years ago at Beth Israel brings 97 percent of all outpatients to the clinic at the time the physician will see them. In most clinics, the patients are seen by the same physician on each visit.

Benches in a given clinic area are

sion of services to organization and quality of medical care, Brindle said. In his opinion, individual health needs can be met only by complete prepayment for a comprehensive range of covered health services, rational organization of medical services, and direct attention to the quality of these services.

When all medical services are included in an insurance plan and are completely prepaid, there will be "no artificial encouragement of medically unnecessary surgery or hospitalization" and medically appropriate services will be used, Brindle stated.

Organization of Medical Care

UAW "is firmly convinced that the problems posed by the increasing complexity of medical science and technology can be met in large part by group practice," Brindle said. Group practice, coupled with complete prepayment for services, will encourage preventive medicine as a matter of good economics as well as good medicine, he asserted.

However, he pointed out, within the group the personal physician must have a central place, for "the personal and confidential relationship between patient and doctor represents the cornerstone of personal health service." But back of the physician must be the specialists, who will work with him to provide complete and balanced health services.

Concerning reimbursement, Brindle said that the method used should relieve the physician of preoccupation with business and fiscal matters and allow him to devote himself to caring for his patients.

Quality of Medical Care

Despite the long history of a "hands-off" policy toward supervision of medical care by insurance plans, such supervision must be developed, not only to control the quality of medical care but to prevent the abuse of medical services when benefits are broadened, Brindle declared. He suggested that a system

of evaluation and professional review by a committee, such as is used by one Canadian plan, might improve the quality of care provided by prepayment programs.

Provision of completely prepaid, comprehensive medical care will be achieved only through "bold and imaginative experimentation," and unions will support such experimentation, Brindle stated. He said that the president of UAW had met recently with a group of interested community leaders in Detroit "to set up a comprehensive medical care program based on group practice by salaried physicians in community hospitals," open not only to UAW members but to everyone in the community.

Management Reviews Medical Care Plans

Industrial management is becoming increasingly interested in non-occupational medical costs and means of paying them, including comprehensive health insurance and other prepayment plans, stated E. S. Willis of the General Electric Company, New York, N. Y.

Medical insurance should provide broad coverage, Willis said, and should pay the major portion of the larger, unpredictable costs of injury or illness, both in and out of hospitals, including specialist care and variable costs such as those due to complications and geographic location. The individual can take care of small bills or bills for preventive medical care, which can be foreseen or planned for, he stated. When small bills occur with such frequency that they become a financial burden, insurance should help in paying them. Medical expenses, although not "happy" expenses, have a definite place in the normal living budget, he emphasized.

Prepayment plans are a form of installment buying, Willis said, and provide basic protection against medical costs. However, they should never supersede direct participation by the individual in payment for medical care. The best individual medical care, Willis pointed out, results from the private practice of medicine, under which the patient has free choice of physician and service and under which he maintains a personal interest in the cost and quality of his medical care.

Epidemiology and Statistics . . .

Controlled Field Trial Of Typhoid Vaccines

Controlled field trials of prophylactics represent one of the most important steps in modern medical progress, asserted Dr. Branko Cvjetanović, of the University of Zagreb School of Public Health, Zagreb, Yugoslavia.

Cvjetanović reported that a trial of typhoid vaccines carried out in Ostijek, Yugoslavia, in the spring of 1954 and 1955, demonstrated that it is possible to prepare an antityphoid vaccine that is effective for man.

This was the first strictly controlled field trial of typhoid vaccines in the history of medicine, he stated. The study was aided by the Public Health Service and the World Health Organization. He stressed the value of a pilot trial and reported that the problems and results of the full-scale field trial were anticipated by the preliminary pilot test.

Typhoid infection in the usual laboratory animals bears no resemblance to typhoid infection in man, and laboratory potency tests cannot be interpreted conclusively because results apparently are more dependent on the tests used and the method

thus strengthening the physician's view and reinforcing his tendency to avoid discussion.

How does the amount of information the physician gives his patient affect the patient's health? This question, Pratt admitted, cannot be answered yet, but, she said, it seems that patients who are given rather thorough explanations participate more effectively in discussion with the physician and are more likely to accept completely his plans for tests and treatment than those who are given little information.

Concept of a Good Physician

Technical competence and skill in handling interpersonal relations received about equal attention in the patients' descriptions of a "good" physician, according to another report of the research at the outpatient clinic. In addition to Pratt and Reader, Margaret Mudd, also at Cornell University Medical College, participated in this report.

About 60 percent of the 50 patients studied mentioned technical competence as an attribute of a good physician, and 58 percent mentioned such factors as kindness, understanding, interest in the patient, sympathy, encouragement, honesty, sincerity, inspires confidence, and "is not in a hurry," Pratt stated. About 24 percent considered both technical competence and interpersonal relations important; about 36 percent mentioned only the former; and about 34 percent mentioned only the latter.

This research, Pratt noted, is designed to determine what constitutes adequate care for patients, to evaluate the adequacy of care offered by the clinic, and to define the role of an outpatient clinic. What patients expect is one element to be considered in establishing standards of care, she said.

Medical Care Goals

Interviews with the 50 patients and observation during their consultations with the physicians provided the following additional information:

The dominant initial goal of two-thirds of the patients was to find out whether they had a serious disease; the rest either wanted a thorough study and a diagnosis or were concerned primarily with treatment.

Almost three-fourths of the patients wanted some kind of treatment or symptomatic relief, and two-thirds of this group specified the kinds of medication or the particular result they wanted. This finding, Pratt observed, demonstrates the pressure physicians are under to give symptomatic treatment.

Most of the patients expressed some interest in obtaining basic information about their problem. However, few made any particular effort to do so by direct questions to the physician or criticized the physicians for not providing it. Apparently, although they have a desire for such information, the clinic patients do not feel that it is the physician's responsibility to provide it, Pratt said.

The patients were notably vague and uncertain about what they thought would be done during their clinic visits, that is, about what types of questions would be asked, whether or not tests would be given, and the like. Also, although most of the patients expected positive results, few hoped for complete cure, and still fewer were really confident of a complete cure. The majority expected symptomatic treatment and reassurance.

Labor Views Medical Care For Industrial Workers

Payments provided by the majority of medical care insurance plans are insufficient to cover the cost of most illnesses, asserted James Brindle, director, security department, United Automobile Workers, Detroit, Mich.

Brindle pointed out that substantial charges are often added to basic indemnity payments for physicians' services and that provisions of income-ceiling service plans often are

not enforced. In many cases, only indemnity insurance is provided, he said, and in some areas which have income ceilings, the ceilings are much too low. UAW has been urging a \$3,000 ceiling for nearly a year and a half but "we are not at all sure that coverage will become available at reasonable cost." In one city where an attempt is being made to develop a \$6,000 ceiling plan, the premium asked is unreasonably high, he said.

Provisions of income-ceiling service plans often are not uniformly enforced, Brindle continued. A UAW survey of charges to workers under the \$3,000 family income-ceiling plans showed that physicians make added charges in as many cases when income is below the ceiling as when it is above the \$3,000 figure.

UAW has been more successful in obtaining full payment of hospital bills than of bills for physicians' services, Brindle said. However, in his opinion, schemes for reimbursing hospitals for services to patients generally do not furnish incentives toward economy and efficiency.

Increased Premiums

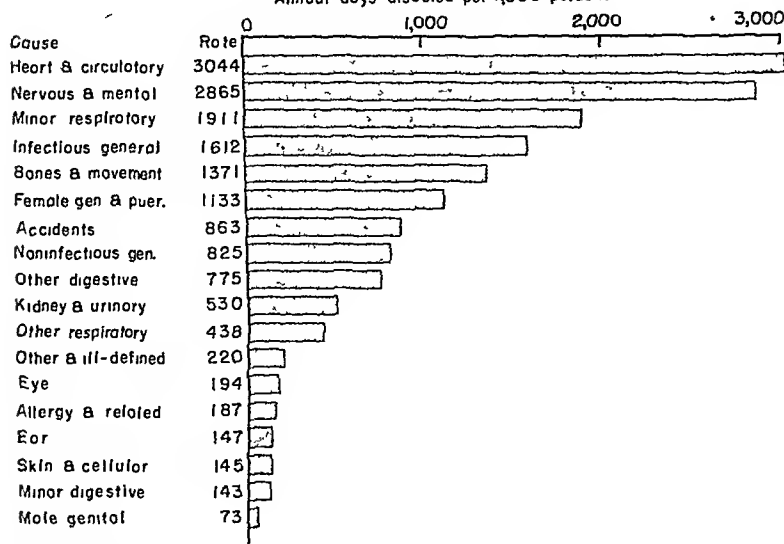
The emphasis of most plans on in-hospital care and surgery has led to a substantial amount of hospitalization which is not medically indicated, and this increases prepayment costs, Brindle stated. Indemnity plans keep premiums low by reducing benefits, but service plans steadily increase premiums, he said. Co-insurance, deductible programs, and so-called major medical coverage only shift more of the burden of illness from the group to the individual, he asserted. Brindle emphasized, however, that labor's concern with increased costs of medical care is directed at remediable situations and not at broadening of benefits and justifiable improvements in wage levels, working conditions, and technical facilities.

Areas of Coverage

The focus of labor's demands on health insurance is changing from comprehensive benefits and exten-

Causes of Days of Disability

Annual days disabled per 1,000 persons



Cardiovascular diseases are responsible for the largest number of days of disability annually in the American population. These and nervous and mental diseases rank high because of their long duration. Minor respiratory diseases are a major cause of disability because of frequency. (PHM chart)

The laboratory, in addition to studying the reaction to the various vaccines during the epidemic, analyzed their effect according to the occurrence of AFRI before and after the epidemic and among persons residing in 112 households having one or more virus-positive illnesses. In these households, AFRI attack rates were significantly low in the total and consistently low in each study and age group among persons who received type B vaccines.

Field Trials Are Important In Testing New Vaccines

Field trials are essential in determining the value of new vaccines, stated Dr. W. Charles Cockburn, director of the Epidemiological Research Laboratory, Public Health Laboratory Service, London, England.

Statistical criteria for field studies of vaccines were set up nearly 50

years ago, Cockburn said, although actual trials at that time were unsatisfactory. In the past 20 years, however, these criteria have been used to evaluate pertussis, BCG, poliomyelitis, influenza, and other vaccines.

The early trials of a new vaccine indicate only that the particular lot used is effective under the test conditions, Cockburn pointed out. Then, after the effectiveness of a lot of vaccine has been established, a method of standardizing the antigenic potency of each batch must be devised. However, laboratory standardization of vaccine is difficult, he said, because it has not yet been determined that tests in laboratory animals give a direct measurement of the factor or factors necessary to protect man.

As many batches of vaccine as possible should be tested in the laboratory and in the field, and the laboratory test chosen for standardization should be one which shows good correlation with results of the

field trials, Cockburn emphasized. However, the number of field trials that can be made depends on the number of cases of the disease, and unless the incidence of a disease is high, it is almost impossible to obtain conclusive evidence of correlation between the results of field trials and of laboratory evaluations, he stated.

In closing, Cockburn discussed the health officer's part in vaccine trials. The health officer must be "an unwearying observer that vaccines continue to be of good potency and that they are not provoking unpleasant sequelae," he said. Often the health officer's observations will only point to a problem that will require extensive research for its solution, he stated. "But the important observation is the preliminary one, and in preventive medicine, the health officer is in the best position to make it."

Life Table Applicable To Variety of Studies

The life table has many applications to health and population studies, according to Mortimer Spiegelman, Metropolitan Life Insurance Co., New York City.

Emphasizing its versatility, Spiegelman listed among its uses these: to compare health conditions of communities; to evaluate therapy and as an aid in prognosis; for studies of hospital data; to estimate incidence of certain morbid conditions; and for studies of marriage, population growth, and the labor force.

To introduce his subject, he distinguished between the generation life table, which is a record of a group or cohort covering the period from birth to the loss of the last life, and the current and projected life tables, which represent hypothetical situations.

The current life table is derived from the mortality rates according to age observed during a short calendar period among the many generations then in existence, he explained.

of performance than on the efficacy of the vaccine, Cvjetanović said. Therefore, the issues raised by the differing opinions of laboratories, field workers, and health authorities can be resolved only by a controlled field trial.

Alcohol-killed and alcohol-preserved vaccines and heat-killed, phenol-preserved vaccine were tested on volunteers, using Flexner II phenolized vaccine as a control, Cvjetanović said. Phenolized vaccine proved to be superior to alcoholized vaccine, which suggests that Vi antigen may not play the major role in protection against typhoid fever. The Vi titer in the serums of vaccinated persons was significantly higher following use of alcoholized vaccine. Thus, the vaccines used could be differentiated from each other by serologic tests on vaccinated persons, he stated.

The results of currently used laboratory potency tests of vaccines in animals are not yet comparable with results of potency tests in the field, and further investigations are needed, Cvjetanović stated. Among the questions still to be answered by controlled field trials are the value of acetone-dried and other types of vaccine and the protection conferred by 2 injections of antigen compared with that conferred by 3 injections, he concluded.

Influenza B Vaccine Of Little Value in 1955

In evaluating the effectiveness of influenza vaccines, the Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases, Public Health Service, reported that though type B oil adjuvant vaccine provided definite protection against epidemic disease caused by influenza B virus which occurred in 1955, the amount of protection was slight and perhaps of no practical consequence.

An antigenic shift in type B influenza virus strains, sufficient to overcome immunity to early strains, was suggested as one possible explanation

for the lack of better protection.

As compared with influenza A, the infrequency with which influenza B occurs in epidemic form has made evaluation of vaccines difficult in the past, according to the laboratory.

Participating in the present study, one of a series, were Drs. Robert N. Philip, Joseph A. Bell, Dorland J. Davis, Joseph I. Engler, Gilbert W. Mellin, and Kenneth K. Takemoto. All were members of the laboratory staff during the study.

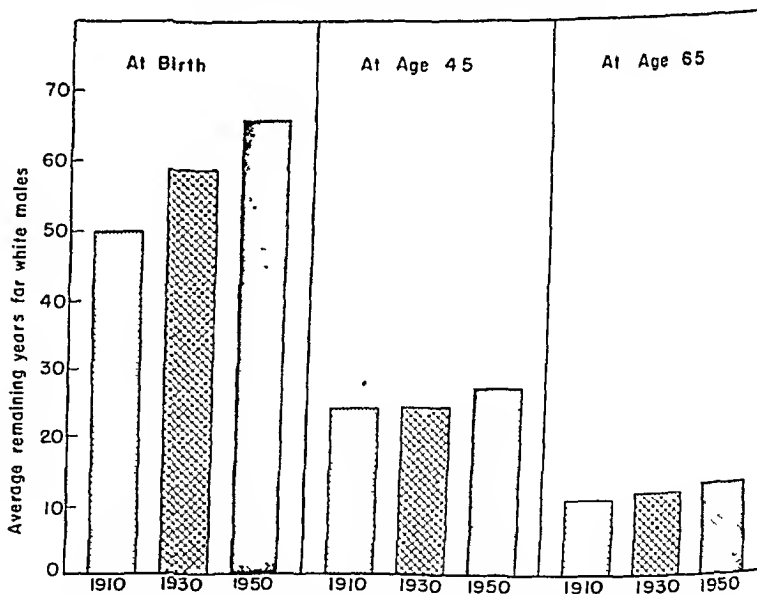
The laboratory tested the efficacy of the following types A and B monovalent inactivated virus vaccines on separate groups of persons each fall: in 1951 and 1952, two type A (A/PRS, A/FLW/1/50) and two type B (B/Lee, B/Va/1/50) mineral oil adjuvant vaccines; and in 1953 and 1954, two oil adjuvant (A/FLW/1/52, B/Lee) and two aqueous (A/FLW/1/52, B/Lee) vaccines.

Ten thousand forty-six persons

who received only a single dose of vaccine in one or another of the study years were observed for the occurrence of acute febrile respiratory illness (AFRI) during a 7-week outbreak of influenza B in the winter of 1955. Definitive diagnosis of influenza was based on laboratory isolation of influenza virus from AFRI, defined as sudden illness affecting the respiratory tract, lasting 2 or more days, and accompanied by an oral temperature of 99° F. or above.

AFRI attack rates for all vaccination and age groups in the 1955 epidemic were slightly but significantly low among persons who had received type B adjuvant vaccines. Type B aqueous vaccines conferred no protection. One hundred forty-two strains of influenza B were isolated from AFRI occurring during the epidemic. No strains of influenza A had been isolated at any time in 1954 and 1955.

Increasing Life Expectancy



In 1950, the average length of life that could be expected at birth of a white child was about 70 years, up about 40 percent from expectancy in 1900. For a nonwhite child, the length of life expected was 60 years, up 80 percent from 1900. The great gains in length of life have resulted primarily from reduction of infant mortality and childhood diseases. (PHM chart)

the recorded rise in nondisabling chronic conditions may be caused by the patient's telling the interviewer that he still has a condition that he had reported earlier even though it might actually bother him very little, Collis explained.

Some persons in the study population who were not ill at the beginning of the study developed chronic conditions during the study period, some of them disabling and some nondisabling, Collins stated.

Full-time person-years of observation for all individuals, whether sick or not sick, totaled 21,505, Collins reported. For chronic diseases, days of disability totaled 219,857, or 10.2 days per person in the entire observed population. Thirty percent of the total days of disability were spent in bed; 70 percent of the total of 63,696 days in bed on account of chronic disease were spent in the hospital; and 71 percent of the 44,408 days in the hospital were

spent in long-term hospitals for chronic diseases for periods of a year or more or as long as the patient remained under observation in the study.

Days of disability per chronic disabling case averaged 140; days in bed per chronic bed case, 65 days. Days per hospital case in both short-term and long-term hospitals averaged 102 days annually, including cases in institutions for a year or longer.

Summarizing the findings of the study, he reported 1,420 full-time years of observation of patients who had disabling chronic disease at some time during the study period, an annual death rate of 114.8 per 1,000 persons with disabling chronic disease, and a recovery rate of 9.2 per 1,000. Corresponding figures for patients with nondisabling chronic illness were 2,306 full-time years of observation and 3.0 recoveries.

way for "antithrain immunization" prior to each pregnancy, Pasamanick reported.

Lacking preventive techniques for disorders of reproductive casualty, ranging from cerebral palsy to accident proneness, today's best evidence lies in longitudinal studies of children born prematurely or to mothers subjected to complications of parturition, he said. Future research, with control of the many variables, should eventually pin down the relationship of early experience to function in later life, he believes.

Distinguishing between the difficulties in old age that are distinctly vascular phenomena and the disorders loosely called senility, Pasamanick said that, with nutritional improvement, better understanding of psychosocial stress, and expectations for some of the new drugs, deterioration and illness may be prevented or decreased to the point where happy noninstitutional life is possible.

Pasamanick ended his review with a discussion of possibilities in the distant future, predicting facetiously that such terms as emotion, motivation, maturity, anxiety, and thinking will be replaced in scientific terminology by a classification of physiological, chemical, and electrical correlates of behavior.

Mental Health . . .

Foresees Future World Freed of Human Error

The renaissance of medicine and public health brings exciting prospects for alleviating the mental disorders of childhood and old age, according to Dr. Benjamin Pasamanick, director of research, Columbus (Ohio) State Institute of Psychiatry. Ready availability of funds and emergence of scientific method in medical and psychiatric education have stimulated researchers to intensive studies of causation.

New evidence for schizophrenia points to the probability of inborn errors of metabolism within the central nervous system, Pasamanick reported. Similar evidence holds hope for the manic-depressive psychoses, he added. Once the crack is made in the functional psychoses, and he believes it will come within 10 years,

methods of therapy and prevention will follow swiftly, he said. Society is obligated to explore large-scale rehabilitation, he continued, long before thousands of patients return to the community.

In reviewing research progress, largely in his own institute, Pasamanick observed that diseases of hereditary origin no longer appear hopeless. Once the genetic mechanisms are delineated, these disorders will be easy to manage, either by prevention or direct manipulation of chemical constituents, he added.

In mental retardation, there is strong evidence of prenatal factors in organic etiology and sociocultural factors in psychological causes, Pasamanick continued. He described the isoimmunization hypothesis that some women harbor antigens from an infected fetal brain which may damage all future offspring. Research hopes to pave the

Pilot Program Expands Mental Nursing Services

A pilot program allowing public health nurses to offer supportive service to the families of mentally ill patients has been successful in Georgia since January 1953, said Dr. Guy V. Rice, Jr., director, health conservation services, Georgia Department of Public Health.

Followup studies since then have shown that the public health nurse performs this service well, and it is one that gives her a feeling of accomplishment. The family receives her assistance in times of crisis, and she can assist the family also in other areas within her jurisdiction.

The projected life table is computed from projected rates of attrition by death.

Multiple decrement tables and select tables are specializations of the life table, according to Spiegelman.

In the multiple decrement table, he said, the column of the living and,

consequently, other data are split into components on the basis of newly acquired characteristics or of changes in status. For example, in a cohort of females traced from birth, it is possible to distinguish between those who marry and those who remain single.

In the select table, rates of decre-

ment are set down in a two-way classification, Spiegelman explained. One is duration since acquisition of a new characteristic or change in status; the other is usually attained age at time of acquisition or change. For example, rates of remarriage for the widowed may be shown in a select table on the basis of both age at widowhood and duration since the event.

Among examples of life table uses, Spiegelman mentioned analyses by causes of death. The distribution of life table deaths according to specific causes is the first step in computing the changes of ultimate death from such causes, he said. "The desired result is obtained by summing the life table deaths from a specific cause after a stated age and dividing the total by the life table survivors to that age."

For studies of population problems, he mentioned the "net nuptiality" table (attrition by death and by marriage) and the "gross nuptiality" table (attrition by marriage alone), which he said can be used to calculate eventual chances of marriage and the effect of mortality on these chances.

Persons with chronic disease, Baltimore Eastern Health District morbidity study, June 1, 1938-May 31, 1943

| | Study year | | | | | |
|--|------------|-------|-------|-------|-------|-------|
| | 1st | 2d | 3d | 4th | 5th | All 5 |
| Total persons with 1 or more chronic diseases ¹ ----- | 936 | 1,009 | 1,016 | 581 | 556 | 4,098 |
| Disabling chronics----- | 399 | 405 | 376 | 217 | 177 | 1,574 |
| Nondisabling chronics----- | 537 | 604 | 640 | 364 | 379 | 2,524 |
| Disabling chronic cases: | | | | | | |
| Prior onset (in study, 1st visit)----- | 293 | 218 | 200 | 109 | 105 | 925 |
| Prior onset (moved into study)----- | 21 | 36 | 31 | 13 | 9 | 113 |
| New cases (onset within)----- | 82 | 75 | 59 | 35 | 19 | 270 |
| Newly disabled (from nondisabling)----- | | 76 | 86 | 60 | 44 | 266 |
| Moved out (disabled this year)----- | 39 | 47 | 38 | 14 | 23 | 161 |
| Full-time years of observation as disabling chronics----- | 390 | 355 | 329 | 184 | 162 | 1,420 |
| Deaths from chronic disease----- | 48 | 44 | 36 | 21 | 14 | 163 |
| Annual deaths per 1,000 persons with disabling chronic diseases----- | 123.1 | 123.9 | 109.4 | 114.1 | 86.4 | 114.8 |
| Recovery ² from disabling chronic diseases----- | 3 | 3 | 5 | ----- | 2 | 13 |
| Annual recoveries ² per 1,000 persons with disabling chronic diseases----- | 7.7 | 8.5 | 15.2 | ----- | 12.3 | 9.2 |
| Deaths from nonchronic causes among persons with disabling chronic diseases----- | | 1 | 3 | 2 | 5 | 11 |
| Annual nonchronic deaths per 1,000 persons with disabling chronic diseases----- | | 2.8 | 9.1 | 10.9 | 30.8 | 7.7 |
| Nondisabling chronic cases: | | | | | | |
| Prior onset (in study, 1st visit)----- | 410 | 405 | 434 | 273 | 281 | 1,803 |
| Prior onset (moved into study)----- | 61 | 64 | 53 | 33 | 19 | 230 |
| New cases (onset within)----- | 66 | 48 | 47 | 23 | 10 | 194 |
| Nondisabling this year (from disabling)----- | | 87 | 106 | 35 | 69 | 297 |
| Moved out (nondisabling this year)----- | 45 | 69 | 64 | 41 | 44 | 263 |
| Full-time years of observation as nondisabling chronics----- | 497 | 546 | 571 | 339 | 353 | 2,306 |
| Recovery ² ----- | | 5 | 2 | ----- | ----- | 7 |
| Annual recoveries ² per 1,000 persons with nondisabling chronic diseases----- | | 9.2 | 3.5 | ----- | ----- | 3.0 |

¹ Includes persons in long-term institutions as well as those in short-term hospitals and those not in any hospital.

² "Recovery" means that the person became free of all chronic diseases.

Baltimore Morbidity Study Reports on Chronic Illness

Rates for disabling and nondisabling chronic illness in Baltimore's Eastern Health District increased 4.9 and 14 percent, respectively, within a 5-year period, according to Dr. Selwyn D. Collins and F. Ruth Phillips, of the Division of Public Health Methods, Public Health Service. Collins, in the W. Thurber Fales Lecture, described the methods used in, and the results of, a morbidity study in the district during the period June 1, 1938-May 31, 1943.

Apparently there are many more persons with a chronic disease or impairment that is not severe enough to interfere with their work than there are persons with a serious chronic disease that causes them to lose time from their regular activities, he stated. However, some of

The mind, while never rigidly differentiated from the body, is more delicate, and, reaching out into the world, it is our most exposed property. It is the most vulnerable part of a person and requires, in a sense, greater care than the body.

Mental hygiene should begin with the life of the normal, or almost normal, man and should attempt to teach him how to live so as to avoid mental illness or to check it in time, the psychiatrist said. It should study the causes of mental trouble in the individual. It should seek to discover the relationship between the personal mind and social life.

Speaking for the benefit of those public health workers and psychiatrists who may still be indifferent to the natural relationship between their areas of endeavor, Liber declared that the hygiene of the mind is destined to participate in all aspects of public hygiene: school hygiene, industrial hygiene, public hygiene of towns, cities, States, and countries, and even international hygiene.

If you are concerned with prenatal care, for example, it is not enough to know something about the pregnant woman's nutrition and the general hygiene of gestation, Liber said. You should also be familiar with the mental state common to women passing through that critical experience: their moods, their needs of sociability or isolation, of tranquility or entertainment.

Anyone interested in infant and child care, he continued, should be thoroughly informed concerning the regular development of intelligence, about the exceptional child, about the particularly gifted or talented, and about the effects of environment on the mental growth of children.

The public health worker in charge of school hygiene would do great injustice to his young clients if he were prepared to deal only with physical health. There is a special school psychology that influences the individual boy and girl, he said.

Liber proceeded to discuss similarly the need for recognition of the interdependence of mind and

body in other health and social areas: child delinquency, crime, married life, industrial hygiene, social work, and health education, for example.

In all the subdivisions of public health work, one cannot help coming in contact with obstacles due to mental states of groups or of individuals, he said. Therefore, the public health worker must be well informed in mental hygiene and, to a certain extent, about mental disease as well, he concluded.

Mental Health Workshops Major Aid to Teachers

Educators are gaining insight into some basic principles of mental health through mental health workshops, according to Dr. Harriett B. Randall, assistant medical director of the Los Angeles City Board of Education.

Such a workshop, she said, was the 1949 pilot mental health workshop in Los Angeles sponsored by the California State Department of Public Health.

In planning the workshop for the Los Angeles city schools, it was possible to invite specialists from various parts of the country to work with the local staff and participants. The staff consisted of psychiatrists, psychologists, and educators.

Seventy-two participants were invited, representing all levels of education and special activities.

Workshop Pattern

Each workshop group had 12 members among whom were an administrator, elementary and secondary teacher, counselor, attendance supervisor, school physician, school nurse, and health coordinator. An educator, a psychologist, and a psychiatrist worked with each group.

The workshop lasted for 2 weeks. During the first period of each day a 1-hour basic lecture was given by a staff member. This lecture represented the topic for the day.

Topics were concerned with hu-

man behavior in infancy, early childhood, adolescence, and adulthood. Special topics covered mental hygiene problems in schools, pupils' emotional problems arising out of physical disabilities, and emotional and interpersonal relationship problems of school personnel.

General and group discussions, playlets, films, and panel discussions interspersed each day's activities.

The workshop was designed to evoke wholesome attitudes and responses in the participants, and brief, meaningful reports on the activities were submitted. These informal reports were incorporated into a mimeographed booklet, along with a statement of the workshop plan and purposes, abstracts of the 10 basic lectures given, and a list of reference materials.

The participants reported that the workshop had given them insight into personal problems and understanding of functional relationships among pupils, teachers, administrators, and school and community agencies. They learned techniques of parent-child counseling and gained perspective through meeting with all levels of school personnel. One of the most important effects was understanding of the principles of mental hygiene and the relationship between emotional growth and development and human behavior.

A followup meeting was held 6 months after the workshop. Many subsequent mental health workshops have followed the pattern of the original workshop.

Invaluable Aid

A survey of reactions to the workshop was conducted in the summer of 1956. Of the original 72 participants, 55 could be located, and they were sent questionnaires. Thirty-six responses were received. The respondents stated that the workshop had been of continuous benefit to them in their relationships with pupils, parents, and administrators. They found the workshop had increased their awareness of mental health. They were able to understand and aid the emotional

The nurse can prepare the family to accept the patient's illness or help the patient take his place in the community when he is released from the hospital. Because the hospital is cooperating with the local health department, it receives valuable information about the patient and his family. Besides assisting the family and the hospital, the health department is a medical source to which other county officials may turn.

Several questions were raised by psychiatric and social work consultants before the program was begun. Was the public health nurse qualified to deal with mentally ill patients? They judged that, since the nurse would be giving the same kind of service that she gives to other patients and families, she would be qualified with proper orientation. Would the nurse be too apprehensive about mental illness to work effectively? It was found that initial fear was allayed after orientation at the State hospital and close supervision by the mental health consultant nurse during the first home visits.

Would the patient and his family resent the public health worker? In a few instances, the public health worker was resented, but most families were grateful and appreciative of the understanding and support given them by someone whom many of them already knew and respected.

Finally, was this a social work job? Much of the work done by the public health nurse could be broadly classified as social work, but the emphasis was on the nurse's professional role, Rice explained.

In order to make such a nursing service plan effective, he added, it is necessary to define objectives clearly, discuss the program fully with all personnel who provide this service to get full acceptance and cooperation, provide adequate orientation in the mental hospital setting, and employ a mental health consultant nurse and mental health worker on the health department staff to provide consultation and assist where necessary.

This supportive service should be an integral part of the local health department program, closely allied with the nursing service, he declared. The nurse should have assistance and advice from a psychiatrist, to whom she can also refer patients. And the hospital and public health and other State agencies should each understand the responsibilities, abilities, and limitations of the other, he concluded.

Baltimore Survey Finds 10 Percent Mentally Ill

Approximately 10 percent of a noninstitutional urban population are at one moment in time mentally ill, according to preliminary data developed from the illness survey in Baltimore by the Commission on Chronic Illness.

This information was reported by Dr. Pasamanick also in collaboration with Dr. Dean W. Roberts, executive director, National Society for Crippled Children and Adults; Dr. Paul V. Lemkau, director, New York City Community Mental Health Board; and Dean E. Krueger, Columbia University School of Public Health.

The estimate may be all too true for the country as a whole, and in any event warrants serious consideration, according to the authors. Baltimore, except for a large non-white population, is similar to other cities in family income and age distribution, they stated, adding that the nonwhite population (27 percent) tends to lower rates.

"We doubt very much that a population having more than this rate of mental illness, in addition to the heavy load of chronic and acute disease found in the Baltimore survey, could function as a society," the report asserted.

Only the psychoses, psychoneuroses, and psychophysiological autonomic and visceral disorders prevailing in a sample of 809 male and female patients of all ages, 86 of whom were diagnosed as mentally

ill, are reported. Full details of the Baltimore survey, including hypothetical leads for further study, will be published by the Commonwealth Fund and the Harvard University Press. Some of the major findings follow:

- The psychoneuroses were 12 times as common as the psychoses, and the psychophysiological disorders were two-thirds as common as the neuroses.

- Male psychoses were twice as frequent as psychoses in women, but women had more psychoneurotic and psychophysiological disorders.

- The psychoses ranged from moderate to severe, or from interference with social and vocational adjustment to inability to function at premorbid levels.

- Impairment in patients with psychoneurotic and psychophysiological disorders either was insignificant or, at most, mild.

- The psychoses rose sharply with age, from no cases under age 15 to few only between ages 15 to 34, but from 5.8 cases per 1,000 population between ages 35 to 64 to the high rate of 27.8 at age 65 and over.

- Under age 15 and over age 64, no psychophysiological disorders were found, but in the young adult group (15 to 34) the number of cases was significantly more than in the middle ages (35 to 64).

Mental Hygiene Related To All Public Health

"The welfare of the mind and of the mental faculties belongs even more to the domain of public hygiene than the well-being of the other human functions because the mind is the principal link between the individual and society," avowed Dr. Ben Zion Liber, emeritus professor of psychiatry, New York Polytechnic Medical School.

The mind, more than the body, he said, must adjust itself to all circumstances of life, must give and take, must make concessions, must find its place among other minds.

bonus, overtime pay, and free medical and hospital care.

Though the average top salary of the sanitarian has been rising more rapidly since 1954 than for any other salary group, the median salary since 1952 has been \$2,000 or more below that of engineers in local health departments and approximately \$750 below the median salary paid to male professional and technical workers in the United States.

Seven percent of the sanitarian positions studied were vacant. Thirty percent of these were available to college graduates with no experience, offering a starting salary of \$4,479. Vacant positions for sanitarians offer higher salaries than filled ones. Among 675 filled positions with the same requirements the median starting salary was \$4,347.

Members of the reporting committee are Walter A. Lyon, chairman, William T. Ballard, Herbert J. Dansmore, Reinhart W. Koch, John W. Lemon, Eric W. Mood, Louis W. Pickles, Jack C. Rogers, and Lester A. Sanger.

Copies of the report may be obtained by writing to Walter A. Lyon, Philadelphia Department of Public Health, Room 630, City Hall Annex, Philadelphia 7, Pa.

New Training Opportunities Stressed in Pennsylvania

The Health Amendments Act passed by Congress in July 1956 "marks a tide that, taken on its full, will lead to signal new achievements" in the training of public health workers, declared Dr. Henry R. O'Brien of the Pennsylvania Department of Health.

Traineeships provided under title I and title II of this act are among the resources used in Pennsylvania to increase professional training of State and local health workers, O'Brien said. He urged all health officers to make definite plans for using the opportunities afforded by

the act, in addition to all other training opportunities.

O'Brien described in detail Pennsylvania's progress in training health personnel since 1948, covering both organization and kinds of training.

Training, an activity found in every division of the health department, is stimulated and coordinated from one place, the division of professional training, he indicated. He considers this pattern the most satisfactory one.

The division of professional training, which O'Brien heads, is responsible for the Pittsburgh field training station. Set up in 1949 by the University of Pittsburgh, the Pittsburgh Department of Health, the State department of health, and the Public Health Service, this unit offers a number of formal and informal courses in various fields of public health.

The division also works closely with the program bureaus and divisions of the State health department, with the State tuberculosis and crippled children's hospitals, with educators in the city and county health departments, and with the universities on matters of education and training for health workers.

In the fall of 1956, the division was paying tuition for 6 workers enrolled full time in schools of public health and for 15 public health nurses studying full time, one from a visiting nurse association, O'Brien stated. In addition, the State department of health is aiding 166 State, county, city, and visiting nurse association nurses who are taking public health courses part time in 9 cities.

A feature of the program to which O'Brien called attention is a register of education and training, kept on 5" x 8" cards, for each of the health department's 900 or more professional and technical employees. Education and general experience before employment by the State and education or inservice training since then are listed. Such a register, he said, aids in planning training for an individual or a group.

Performance Budgeting Believed Oversold

Distinctions between performance reporting, performance budgeting, and program budgeting were delineated by Drs. Leon J. Taubenhau, Brookline (Mass.) Health Department, Robert H. Hamlin, director of the department, and Robert C. Wood, assistant professor of government, Harvard Law School.

Stressing that these practices are not the "be-all, end-all" of administration, but valuable tools nevertheless, the authors indicated that health agencies will find the program budget, used in combination with performance reporting, best suited for program evaluation. The limited size of most health agencies, where not too many operations are routine, plus the intangible nature of health objectives tend to make measurement by the performance budget too difficult, they believe.

In performance reporting, all activities are reported in terms of work accomplished in a specific program. A nursing visit, for example, is reported according to the purpose for which it is performed: tuberculosis, communicable disease, school health followup, or some other typical health service. To be effective, performance reporting must coincide with the program budget, which emphasizes the cost of each program in relation to the total budget. The system must not be oriented to functional bureaus or divisions, they said.

In program budgeting, proposed expenditures are usually presented for salaries, supplies, and equipment. The program budget is merely the traditional line budget presented on a program rather than on a functional basis. Once established, each program budget is developed by the program head and requires little extra effort above that required to produce the annual budget.

Performance Budget

The performance budget has brought confusion to budget circles, especially in health agencies, the

adjustment of their pupils, while increasing their own ability to handle individual classroom and administrative problems.

Of the 22 staff members queried, 11 replied to the questionnaire. They found the workshop an invaluable aid to understanding the problems of educators. Many said that they had learned a lot from the participants. Some said that teachers needed increased knowledge of mental health problems and hoped that educators could participate in further mental health workshop activities.

Reading Disabilities Studied As Clue to Other Conditions

Retardation of reading ability is very often associated with unfavorable environmental conditions or emotional problems, or both, in the child and his family according to preliminary findings reported by the Mental Health Study Center, National Institute of Mental Health, Public Health Service. Drs. Alan D. Miller, Joseph B. Margolin, and Stanley F. Yolles presented the center's findings.

Hoping to develop hypotheses concerning the effect of environment on reading ability and to use these hypotheses to work out a screening device which would be useful in determining the "type of soil in which related mental health problems take root," the authors are studying the reading disabilities among school children in Prince Georges County, Md.

The 2-year survey showed that reading disabilities were $1\frac{1}{2}$ times greater among the children who were patients at the center than among the general school population and that more boys than girls were affected. None of the children included in this sample were mentally deficient.

Starting with the conjecture that a fairly limited disorder, such as reading disability, may be an indication of the presence of other distur-

ances, the initial survey showed that among all the children, ages 7 through 17, examined at the center since 1948, 27.2 percent presented some reading disorder: boys, 36.7 percent, and girls, 23.5 percent.

Children's interests, attitudes, general behavior, the impact of the

family, school, and community on them, and the effect of their reading disabilities on their daily lives are being studied at the center. This report covers one phase of a study of the epidemiology of mental health and illness being conducted at the Mental Health Study Center.

Manpower and Brainpower . . .

Health Departments Lag In Sanitation Salaries

Competition by employers for qualified graduates is reflected in the first of five reports by the Committee on Salaries of the Conference of Municipal Public Health Engineers.

In this competition, health agencies fall by substantial margins to pay the going price for competent personnel in environmental services.

The committee surveyed the salaries of engineers, sanitarians, sanitary inspectors, veterinarians, sanitary directors, and other environmental health personnel in 371 full-time local health departments. In its report is shown the rise in salary levels from 1951 to 1956. Much of the information presented is based on a sample of 35 departments.

According to the report, salaries

have been rising steadily at rates varying from 5 to 13 percent each year, but they do not match those paid in similar professional categories outside health departments.

Present salaries for engineers are well below those paid to other members of the profession. In 1952-54 the median salary was \$1,000 below the median for county and municipal engineers and \$2,400 below the median for all engineers. Under the circumstances, the number of vacant engineering positions in local health departments has tended to increase.

Starting salaries in health agencies for engineers with no experience in 1956 ranged from \$4,250 to \$4,650, but engineering schools predict that their 1957 graduates will expect around \$5,250. In addition to paying higher salaries, private employers tell the young engineer that his interview and moving expenses will be paid, that he will receive an annual

Median maximum salaries of sanitarians and engineers in 371 local health departments by geographic area, 1956

| Geographic area | Sanitarians | Engineers |
|--------------------|-------------|-----------|
| Far west..... | \$5,614 | \$9,000 |
| Central..... | 4,870 | 7,500 |
| New England..... | 4,866 | 6,750 |
| Southwest..... | 4,631 | 7,834 |
| Middle east..... | 4,630 | 7,250 |
| Northwest..... | 4,449 | 7,000 |
| Southeast..... | 3,917 | 6,725 |
| United States..... | 4,776 | 7,140 |

increase of \$500,000 over the 1956 figure, showing the acceptance of the principal of orderly growth.

Reasonable solutions were found for such thorny problems as the relationship between the Pan American Sanitary Bureau and WHO, equitable geographic distribution of seats on the Executive Board and offices in the assembly, the participation of inactive members, and meetings of the Eastern Mediterranean Regional Committee. Scheele noted also that a better understanding of fellow members' problems has evolved in the process of working together.

Assembly discussion of the 1957 program showed a shift from the usual heavy emphasis on communicable diseases to other problems such as heart disease, health aspects of atomic energy, vital statistics, and other WHO services. There was also less stress on professional and technical training. According to Scheele, the discussions reflected smooth cooperation and planning within regional groups. These are all signs of maturity and strength, he said.

Resolutions and Recommendations

The drive for malaria eradication was confirmed as a central objective for the immediate future. At the same time, delegates called for emphasis by WHO on rheumatic, hypertensive, and coronary diseases. Following a challenging debate, he said, the assembly approved WHO's atomic energy program, which includes training of public health personnel; development of standards; and studies on effects of somatic and genetic injury, and on radioactive waste disposal.

The assembly also recommended that the governments of the world maintain close contact with public health authorities at all stages of work on atomic energy projects.

Discussions on radioactive waste pollution of the air, soil, and water produced requests for studies of international streams, and recommendations for cooperative studies by WHO and the Food and Agriculture

Organization to determine the effects of radiation on plants and animals used for food.

One of the highlights of the debate on the International Atomic Energy Agency was the statement by an American delegate urging the new international organization to transfer all its public health activities to WHO in order to benefit from the health agency's 10 years of operating experience.

In preparation for WHO's 10th anniversary celebration in 1958, the 9th assembly called on each member to report on its health situation during 1954-56. Subsequently, he said, all reports will be coordinated into a comprehensive report on world health conditions.

Scheele stated that a resolution accepting Morocco, Sudan, and Tunisia as full members, and the Gold Coast, Nigeria, and Sierra Leone as associate members raised the total number of member states to 88. Attending the 9th assembly were delegates from 73 full member states and 4 associate members.

Technical Discussions

Twenty-one delegations included a nurse, reflecting the theme of the 1956 technical discussions, "Nurses: Their Education and Their Role in Health Programs." He explained that these discussions constitute an unofficial activity accompanying each assembly. Pearl McIver, chief of public health nursing, Public Health Service, directed preparations for the discussions, at the close of which a final report was presented to the assembly.

Directly stemming from these talks was Iran's first conference on nursing, and, in Scheele's opinion, the discussions may well furnish the momentum in many countries for the creation of a nursing service in harmony with the needs, resources, and mores of the individual society.

The World Health Assembly has grown to be the foremost public health meeting in the world, stated Scheele, and during this development it has demonstrated that nations

varying widely in size, race, and culture can work together in harmony, with patience and wisdom.

Proposes New Style Medical Education

Medicine is no ivory-tower profession, insulated from world affairs, said Dr. Gunnar Gundersen, chairman of the Board of Trustees of the American Medical Association. More than ever before, it is one of the vital functions of modern civilization.

The dramatic political and economic events of the last 30 years, a period also of striking advances in technology and communications, have sharpened public interest in world affairs. Scientific gains in medicine have multiplied during the same period, he stated, and through international cooperation, the ultimate in knowledge and techniques are steadily spread over the globe. Individual physicians, medical associations and journals, and international health organizations have contributed to the heartening progress in world disease prevention, nutrition, and medical care.

Spectacular developments in medicine have stimulated mounting public interest in medical care, he said, especially in its socioeconomic aspects. As an expression of that interest he cited the striking growth of voluntary health insurance. Health and medical care are the subjects of more and more social, economic, and political proposals. They are also recognized as important contributors to world peace and stability.

As Gundersen sees it, "the dilemma facing today's physician is this: at the very time that medicine is becoming more difficult to master and keep up with, he must also expand his field of interest and action—both as physician and citizen." Fortunately, there are organizations through which the physician can speak and act.

On the international level, the

authors indicated. The performance budget is basically cost accounting on a service unit basis, designed to test the efficiency with which individuals bring about a group accomplishment. Its focus is on "things to be done or accomplishments to be achieved rather than on things to be bought." The objects of expenditure are always arranged in terms of an end product, expressed as a work or service unit.

The service unit could be a patient examination in a clinic, in which the salaries of physician and nurse, or the cost of supplies and equipment, are prorated according to the number of patients seen. Or it could be a sanitary inspection where the inspector's wages, automobile expenses, and secretarial assistance are grouped together. A dollars-and-cents value is assigned.

Though the purpose of a group of actions in health planning can always be identified, as "X-rays completed," "reports filed," "tons of garbage collected," for example, the authors are convinced that it is not always possible to assign a real value to the service. When applied to tasks requiring professional skill and discretion, a unit cost is often as misleading as it is meaningless, they think. The methods they prefer are direct supervision, reporting, inspection, and a summary presentation of costs.

"We feel that it is more important to have knowledge of the total cost of a program, its percentage of the total budget, and an estimate of its accomplishment in terms of work done, than it is to know the cost of a unit of work as an estimate of efficiency or an illusion of value," they concluded.

Citizens Carry Forward Sanitation Projects

Sanitarians need not work alone in providing clean air, water, food, and shelter for the community; they have in the people an almost untapped resource to call upon, according to Robert E. Mytinger, of the

Paper Cup and Container Institute.

Helping people to do things for themselves is based on two principles, he said. People learn by doing, and the decisions they make usually seem more important to them than decisions that are imposed on them.

Mytinger cited several examples of community action that have supported the sanitarian's efforts.

In Georgia, sanitarians in the Macon-Bibb-Jones County Health Department developed five measures in 1955 with the aid of interested citizens.

First was the passage of a bond issue for the construction of a sewage treatment plant, principally because of the interest and activity of the Macon Chamber of Commerce, the Macon Area Industrial Development Commission, and the National Council for Stream Improvement.

Second, a committee of realtors helped obtain legal support for a five-point housing redevelopment program.

Third was the creation of a county planning and zoning commission.

Fourth, a nursing home committee was formed to help guide sanitation practices in nursing homes.

And finally, through the active assistance of local garden clubs, the

sanitarians saw the beginning of the end of open garbage dumps in the Macon area.

The Tulsa City-County Health Department in Oklahoma found that it paid to get the Tulsa Restaurant Association interested in restaurant sanitation.

Without funds to hire someone to organize a food sanitation training program, the department took the problem to the local restaurant association, where a special committee was appointed to investigate the needs and possible solutions.

The result was a recommendation for a sufficient increase in local licensing fees to permit addition of the new health department staff member. Furthermore, the group endorsed a plan requiring all food workers in Tulsa to take a written examination in connection with the training program. In the first 9 months of operation, 3,600 food handlers qualified.

Mytinger named five categories of potential value to the health worker: official government agencies; voluntary health groups; civic, fraternal, and religious organizations; coordinating agencies, such as a health council or federation of civic or business organizations; and unaffiliated citizens.

World Health . . .

World Health Body Comes of Age

The Ninth World Health Assembly set a new mark in the mature quality of its deliberations and statesmanship, declared Dr. Leonard A. Scheele in an address before the National Citizens Committee for the World Health Organization. Dr. Scheele is president of the Warner-Chilcott Laboratories, and former Surgeon General of the Public Health Service. Among the speakers

following Scheele on the program were Drs. Gunnar Gundersen, D. J. Pletsch, and N. S. Scrimshaw.

Dr. Scheele stated that in contrast with other World Health Assemblies in which a charged atmosphere surrounded some issues and blocked truly decisive action, the 1956 meeting dealt with such problems effectively after calm deliberation.

The regular budget, long subject to pressure for substantial increases, was set at \$10,700,000 for 1957, an

This fact was brought out by Dr. Nevin S. Scrimshaw, regional adviser in nutrition with the Pan American Sanitary Bureau, and director of the Institute of Nutrition of Central America and Panama. He explained that in most Latin American countries deaths are not medically certified; registry is based on information from the family or from family friends.

To determine the true cause of death among children in rural Guatemala, the Institute of Nutrition of Central America and Panama with the assistance of WHO consultants arranged for visits to the families immediately after deaths were reported. INCAP is a cooperative institute organized by the Central American countries and administered by the Pan American Sanitary Bureau, said Scrimshaw.

A study of four representative highland villages showed that two-thirds of all children between the ages of 1 to 5, whose death reports listed diarrhea or parasites, actually died of severe protein malnutrition.

Scrimshaw reported the following steps toward the solution of major nutritional problems, achieved by WHO despite limited personnel and budget.

Endemic Goiter

Endemic goiter was recognized to be a major public health problem in all of Latin America after the visit in 1950 of a WHO consultant who trained workers in a number of countries in endemic goiter diagnostic techniques. Reports since then show that in Peru 36 percent of the men and 64 percent of the women have goiter, and in Panama 47 percent of the adults in certain provinces are affected. Figures for Colombia indicate endemic goiter for 57 percent of the total population; for Guatemala an average of 38 percent; and for El Salvador, Honduras, and Nicaragua nearly 30 percent. In many of these countries cretinism has been reported along with deaf-mutism and feeble-mindedness, conditions prevalent in goitrous areas.

The problem of iodine deficiency in these areas was solved by Dr. Frederick Clements, former chief of WHO's nutrition section who spurred the development of procedures for adding iodine to the crude, moist salt used locally. The iodization process used in the United States was inappropriate because it requires that the salt be refined and dry. With potassium iodate added to salt, the average incidence of goiter fell by 42 percent in 15 weeks in a trial on school children in El Salvador, and 65 percent in 25 weeks in a similar group in Guatemala.

In 1955, two WHO consultants assisted all of the Latin American countries in drawing up regulations for salt iodization and in obtaining the appropriate machinery and supplies. Such measures are expected to eliminate endemic goiter as a public health problem from the countries served, in the next few years.

Kwashiorkor

A tragic aspect of kwashiorkor, a disease most often developing from the lack of good quality protein in the diet of children, is that parents usually mistake its symptoms for those of worm infection. As a result, the little solid food the child receives may be replaced by soft, starchy gruels almost devoid of proteins. Affected children, therefore, often do not reach the hospital, and of those who do, 10 to 30 percent die despite the best of treatment.

Most children who survive the disease do not receive enough protein nourishment for normal growth, as shown in surveys of poor urban and rural areas. The belief that children in underdeveloped countries are small in stature and build because their parents are small is false. Central American children grow satisfactorily until after they are weaned and no longer have mother's milk as a source of protein; it is their almost stationary development during preschool years which accounts for the loss in overall growth. From this great reser-

voir of malnourished preschool children come most cases of kwashiorkor.

Since 1950, when consultants from WHO and FAO collaborated to define the precise nature of kwashiorkor and reported its wide incidence in Africa, a number of studies have been made by consultants of these organizations in Central and South America and by Latin American workers. Stimulated by these studies, research was conducted elsewhere with the result that almost all underdeveloped countries report severe protein deficiency.

It was found that in meeting the need for more protein in underdeveloped areas, increased output of cow's milk and other animal proteins had to be ruled out for agricultural and economic reasons. Fish or vegetable protein of good quality was the practical answer. Pilot efforts in Africa, India, and Central America were sponsored by WHO toward this end. In Central America, a tasty mixture has been devised and has proved to be of such satisfactory quality protein that it is not improved significantly by the addition of milk. It is intended as a food supplement but it is more complete nutritionally than milk itself and less than half the price.

In a common effort to overcome protein malnutrition, WHO is also actively supporting educational efforts against food practices responsible for kwashiorkor; FAO is helping to improve production of animal protein; and UNICEF is distributing and conserving milk as well as supporting the development of vegetable protein combinations.

WHO also provides the stimulus for work on nutritional anemia, pellagra, beriberi, diabetes, and nutritional disorders of the eye; and promotes anthropometric and biochemical measures for the evaluation of nutritional status. A new WHO activity is the study of ischemic or coronary heart disease.

The lower income groups in a number of countries are almost free of coronary heart disease, while in

World Medical Association, composed of the national medical associations in 50 countries, and the World Health Organization maintain close liaison with one another to coordinate the best in world health efforts. These two organizations, Gundersen added, strive for mutual understanding between those in government health work and those in private practice. Their area of closest cooperation is the field of medical education. This, said Gundersen, needs to be specially geared to fit the expanding role of the modern physician.

In 1953, at the First Conference on Medical Education, sponsored by the World Medical Association, speakers emphasized repeatedly the need for better general education of potential physicians. The findings of that conference will be reviewed and correlated at the Second World Conference on Medical Education to be held in 1959 in Chicago.

In addition to medical education, he said, another vital consideration for physicians is the urgency of protecting the ethics, traditions, standards, and freedom of medical practice. Towards this purpose, the WMA adopted an International Code of Medical Ethics and a modified Hippocratic Oath known as the Declaration of Geneva. The association has also set up social security principles to protect the freedom of both the physician and the patient, Gundersen stated.

Malaria Eradication Demands Able Men

Thirteen out of the sixteen countries in the Americas with malaria projects at the beginning of 1955, had converted from control to the technically sounder eradication policy by September 1956, reported Dr. Donald J. Pletsch, chief technical adviser of the WHO Malaria Team in Mexico. Of 10 territories, 8 had converted by the same date.

Reviewing the steps leading to adoption of the global eradication

concept, he stated that the danger of anopheline resistance to insecticides was first pointed out at the 14th Pan American Sanitary Conference at Santiago, Chile, in 1954. He then recalled the gravity of a presentation by Indonesian experts at the Second Asian Malaria Conference in Baguio, Philippines, in 1954, in which they demonstrated the non-susceptibility of *Anopheles sundaiensis* to residual applications of DDT. The 13th World Health Assembly committed WHO to worldwide eradication, and on the recommendation of the UNICEF-WHO Joint Committee on Health Policy, UNICEF gave first priority to malaria eradication.

A number of countries have assumed the temporarily high cost of eradication, said Pletsch. The UNICEF forecast of commitments averages \$8,750,000 for malaria out of a total budget of \$25,835,000 annually for the next 3 years. An allocation of \$1,500,000 for malaria eradication work in 1957 was made by the United States for a special hemisphere account administered by the Pan American Sanitary Bureau.

Plans and financial allotments alone cannot guarantee eradication, he said. The ablest men in this field must be mobilized and wisely used. At this point he presented an estimate prepared by Dr. E. J. Pampana, chief of the Malaria Section of WHO, listing by category the number of specialists needed for every million persons to be protected in any program.

To illustrate how personnel, time, and effort can best be utilized, Pletsch cited experiences from work in Taiwan and Mexico. The guiding principles were adaptation and simplification, he said.

According to the Pampana formula, Taiwan's 5½ million persons in malarious areas required 110 mechanic-drivers. Because the island is too small for extensive use of motor vehicles, however, each sprayer used his own bicycle, and squad equipment was divided among the squad members. Only 9 vehicles were used for the malaria service,

and of these only 5 were normally driven by a mechanic-driver.

The Mexican malaria service has only five professional entomologists for the 16 million people in malarious areas, he said, pointing out that the entomologists in Mexico's 14 zones are actually technicians working under instructions of professional entomologists in Mexico City.

The effectiveness of simplicity and ingenuity when combined with administrative ability was demonstrated by an industrial chemist in charge of a DDT powder plant in Taiwan. To fulfill a request for more than 500 tons of DDT per year, he personally took a Chinese Navy ship to the beaches of Okinawa and brought back a shipload of surplus machinery. In his machine shop, he transformed the material into condensers and jet mills which were used to produce DDT according to the most rigid WHO standards.

In Taiwan, the gravimetric measurement of each sprayer charge of insecticide was facilitated by the general use of the Roman balance or individual beam weighing scale on that island. In Mexico, however, no adequate portable scale or balance was in common use. Measurement was originally made by volume, said Pletsch, until the resulting inaccuracies (up to 20 percent) were pointed out. Efforts by international staff members then produced a simple Roman balance, patterned after the Taiwan model, for weighing 300 grams or 670 grams of insecticides.

Such exchanges of ideas, concluded Pletsch, can overcome graver problems inevitable in the global struggle against malaria.

Links Malnutrition, Child Mortality

Malnutrition is a leading cause of death among children in Latin America, even though mortality statistics for the area show diarrheal diseases to be the principal cause, with malnutrition far down the list.

Milk Sanitation Honor Roll for 1955-56

Seventy-three communities have been added to the Public Health Service milk sanitation "honor roll," and 78 communities on the previous list have been dropped. This revision covers the period from January 1, 1955, to December 31, 1956, and includes a total of 235 cities and 50 counties.

Communities on the "honor roll" have complied substantially with the various items of sanitation contained in the milk ordinance suggested by the U. S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized and for those in which both raw milk and pasteurized milk is sold.

The suggested milk ordinance, on which the milk sanitation ratings are based, is now in effect through

This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing, with a summary of rules under which a community is included, was published in Public Health Reports, September 1956, pp. 947-950. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.

voluntary adoption in 436 counties and 1,620 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 11 States and the 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated

in the suggested ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the suggested ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

Communities awarded milk sanitation ratings of 90 percent or more, 1955-56

100 PERCENT OF MARKET MILK PASTEURIZED

| Community | Date of rating | Community | Date of rating | Community | Date of rating |
|-----------------------------|----------------|------------------------|----------------|--------------------------|----------------|
| <i>Arizona</i> | | <i>Georgia</i> | | <i>Georgia—Continued</i> | |
| Phoenix..... | 11-21-1955 | Albany..... | 5-24-1956 | Camilla..... | 9- 9-1955 |
| <i>Colorado</i> | | Athens-Clarke County.. | 4- 8-1955 | Columbus..... | 2-17-1955 |
| Boulder County..... | 12-14-1956 | Atlanta..... | 10-28-1955 | Dalton, Whitfield | |
| Colorado Springs..... | 1-19-1956 | Augusta-Richmond | | County..... | 9- 9-1955 |
| Denver..... | 10-28-1955 | County..... | 11- 9-1956 | Douglas..... | 6-14-1956 |
| Pueblo County..... | 2- 2-1956 | Bainbridge..... | 1-19-1956 | Dublin..... | 3-18-1955 |
| <i>District of Columbia</i> | | Baxley..... | 8- 4-1956 | La Grange..... | 12-16-1955 |
| Washington..... | 3-12-1959 | Cairo..... | 2-25-1955 | Moultrie..... | 11- 4-1955 |
| | | Calhoun, Gordon | | Quitman..... | 8-25-1955 |
| | | County..... | 9- 7-1956 | | |

the upper income groups of most lands and in the United States and western Europe, it is a leading cause of death. These differences were first attributed to poor statistics but it is now apparent that they are real. The comparison of nearly 1,000 aortas from Guatemala and New

Orleans has recently shown that complications of atherosclerosis develop 20 to 30 years of age earlier in the New Orleans group than in Guatemala. These differences parallel those in diet and in way of life; they are not explained by racial factors. A WHO study group met in

Geneva in November 1956 to cover ischemic heart disease, and a second meeting is planned for 1958.

Nutritional deficiencies account for a growing proportion of the total public health problem, as infectious and insect-borne disease control succeeds, Scrimshaw concluded.

Public Health Traineeships for 1957-58

Applications for traineeships in the new public health training program are being accepted for the 1957-58 academic year. Voted by Congress on July 23, 1956, the 3-year program supplies funds to professional health personnel for graduate or specialized training in public health.

More than 330 traineeships have been awarded through the \$1 million appropriation provided for the program's first year. In addition to tuition and fees, stipends cover living expenses for the trainee and legal dependents.

In December 1956, an 11-member advisory committee was set up to assist in planning the program. The members are:

Dr. Franklyn B. Amos, director, office of professional training, New York State Department of Health; Dr. Philip E. Blackerby, Jr., associate general director and director of division of dentistry, W. L. Kellogg Foundation, Battle Creek, Mich.; Robert M. Brown, chief, bureau of environmental hygiene, Maryland State Department of Health; Dr. Rolf Eliassen, professor of sanitary engineering, Massachusetts Institute of Technology.

Miss Roberta E. Foote, director, public health nursing services, The Kansas State Board of Health; Dr. Ruth Freeman, associate professor of public health administration, School of Hygiene and Public Health, Johns Hopkins University; Dr. Hugh Hussey, professor of medicine, Georgetown University School of Medicine, and director of the department of medicine, and physician-in-chief of Georgetown University Hospital.

S. S. Lifson, director of health education, National Tuberculosis Association; Dr. Malcolm H. Merrill, director of public health, California State Department of Health; Miss Marian I. Murphy, professor of public health nursing, University of Minnesota; and Dr. W. L. Treuting, acting chairman, department of tropical medicine and public health, School of Medicine, Tulane University.

Applications for traineeships, which are available from the Division of General Health Services, Bureau of State Services, Public Health Service, should be submitted by April 1, 1957, if possible.

Communities awarded milk sanitation ratings of 90 percent or more, 1955-56—Continued

100 PERCENT OF MARKET MILK PASTEURIZED

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|------------------------------------|-----------------------|------------------------|-----------------------|---------------------------|-----------------------|
| <i>Tennessee—Continued</i> | | <i>Texas—Continued</i> | | <i>Virginia—Continued</i> | |
| Nashville and Davidson County..... | 10-27-1955 | Plainview..... | 6- 2-1956 | South Boston..... | 4-13-1956 |
| Paris..... | 11-17-1956 | San Antonio..... | 2- 8-1955 | Staunton..... | 7-10-1956 |
| Pulaski..... | 9- 1-1955 | San Benito..... | 6-14-1956 | Williamsburg..... | 10-25-1955 |
| Rogersville..... | 11- 7-1955 | Texarkana..... | 3- 9-1956 | <i>Washington</i> | |
| Shelbyville..... | 5-17-1956 | Vernon..... | 10-26-1955 | Spokane..... | 10-24-1956 |
| Sparta..... | 5-16-1956 | Wichita Falls..... | 1-10-1956 | <i>Wisconsin</i> | |
| Springfield..... | 7-23-1955 | <i>Utah</i> | | Ashland..... | 10-10-1956 |
| Tullahoma..... | 10- 9-1956 | Ogden..... | 10-18-1955 | Baraboo..... | 10-18-1955 |
| <i>Texas</i> | | Salt Lake City..... | 2-10-1956 | Beaver Dam..... | 3-29-1955 |
| Beaumont..... | 5-24-1955 | <i>Virginia</i> | | Beloit..... | 12-20-1955 |
| Brownfield..... | 5- 6-1955 | Blacksburg..... | 8-16-1956 | Dodgeville..... | 5-21-1956 |
| Burkburnett..... | 8-16-1955 | Bristol..... | 11- 3-1955 | Green Bay..... | 10- 6-1955 |
| Cleburne..... | 3-13-1956 | Buena Vista..... | 10-28-1955 | Janesville..... | 11-23-1955 |
| Corpus Christi..... | 7-26-1955 | Christiansburg..... | 8-16-1956 | Kenosha..... | 7-14-1955 |
| Edinburg..... | 11-21-1955 | Front Royal..... | 11-10-1955 | La Crosse..... | 1-14-1955 |
| El Paso..... | 10-25-1955 | Glasgow..... | 10-28-1955 | Madison..... | 11-18-1955 |
| Falfurrias..... | 6-22-1956 | Lexington..... | 10-28-1955 | Manitowoc..... | 5-11-1955 |
| Harlingen..... | 6-14-1956 | Luray..... | 11-11-1955 | Milwaukee..... | 6- 8-1956 |
| Houston..... | 5-24-1956 | Marion..... | 11-29-1956 | Oshkosh..... | 7-11-1956 |
| Jacksonville..... | 6- 7-1956 | Norfolk..... | 6- 1-1956 | Racine..... | 7-12-1956 |
| Lufkin..... | 3- 3-1955 | Pulaski..... | 8-17-1956 | Ripon..... | 3-29-1955 |
| Midland..... | 1-21-1955 | Radford..... | 8-15-1956 | Sheboygan..... | 7- 7-1955 |
| Odessa..... | 1-21-1955 | Richmond..... | 4- 6-1956 | Waupun..... | 3-29-1955 |
| Orange..... | 5-19-1955 | Roanoke..... | 6- 1-1956 | | |

BOTH RAW AND PASTEURIZED MARKET MILK

| <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> |
|--|-----------------------|--|-----------------------|--|-----------------------|
| <i>Georgia</i> | | <i>Kentucky—Continued</i> | | <i>Oklahoma—Continued</i> | |
| Carroll County, 97.5.... | 3-24-1955 | Princeton, 96..... | 5-19-1955 | Lawton, 99.2..... | 12-20-1955 |
| Cartersville, 97.7.... | 1-26-1955 | Somerset, 95..... | 2- 7-1955 | McAlester, 84..... | 7-18-1956 |
| Gainesville-Hall County, 92.1..... | 5-20-1955 | <i>Missouri</i> | | Muskogee, 97.6..... | 12-15-1955 |
| Macon, 99.7..... | 6-23-1955 | Joplin 97.5..... | 9- 8-1955 | Norman, 99..... | 1-16-1956 |
| Marietta, 97.8..... | 10-26-1956 | Moberly, 94.2..... | 3- 1-1955 | Oklahoma City, 98.... | 11- 9-1956 |
| Newnan, 95..... | 5- 3-1956 | Poplar Bluff, 97.4.... | 8-18-1955 | Ponca City, 96.6..... | 4-18-1956 |
| Pelham, 94..... | 9- 7-1955 | <i>North Carolina</i> | | Shawnee, 98.8..... | 11-18-1955 |
| Thomaston, 91.5..... | 5- 3-1956 | Cleveland County, 89.9.. | 9-10-1956 | <i>Oregon</i> | |
| Washington, 99.7..... | 11-18-1955 | <i>Oklahoma</i> | | Portland, 99.4..... | 7-30-1955 |
| Winder-Barrow County, 98.5..... | 3-10-1955 | Altus, 94.2..... | 5- 5-1955 | <i>Tennessee</i> | |
| <i>Kentucky</i> | | Elk City, 99..... | 4-30-1956 | Harriman, 96.2..... | 12- 7-1955 |
| Lexington and Fayette County, 99..... | 9-13-1956 | Enid, 98..... | 5- 5-1955 | Kingston, 87.1..... | 11-21-1955 |
| | | Henryetta, 80.7..... | 4-17-1956 | McMinnville, 98.3.... | 5-15-1956 |

Communities awarded milk sanitation ratings of 90 percent or more, 1955-56—Continued

100 PERCENT OF MARKET MILK PASTEURIZED

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|-------------------------------------|-----------------------|--------------------------------------|-----------------------|---------------------------------|-----------------------|
| <i>Georgia—Continued</i> | | <i>Kentucky—Continued</i> | | <i>North Carolina—Continued</i> | |
| Savannah, Chatham County..... | 9-25-1956 | Liberty..... | 10-11-1956 | Durham County..... | 8-7-1956 |
| Valdosta..... | 4-18-1956 | Louisville and Jefferson County..... | 4-19-1956 | Edgecombe County..... | 10-5-1956 |
| Waycross..... | 8-30-1956 | Mayfield..... | 9-16-1955 | Forsyth County..... | 1-31-1955 |
| <i>Idaho</i> | | Monticello..... | 7-20-1956 | Guilford County..... | 9-26-1956 |
| Idaho Falls..... | 6-13-1956 | Morgantown..... | 6-5-1956 | Halifax County..... | 2-16-1956 |
| <i>Illinois</i> | | Murray..... | 3-16-1956 | Lee County..... | 4-8-1955 |
| Chicago..... | 6-28-1955 | Newport and Campbell County..... | 10-20-1955 | Lenoir County..... | 1-7-1955 |
| <i>Indiana</i> | | Owensboro..... | 5-17-1956 | New Hanover County.. | 5-24-1956 |
| Anderson..... | 6-9-1955 | Paducah..... | 8-5-1955 | Onslow County..... | 5-16-1955 |
| Brazil..... | 12-21-1955 | Paris and Bourbon County..... | 5-3-1956 | Orange County..... | 4-5-1955 |
| Calumet region..... | 5-26-1955 | Smithland..... | 6-6-1956 | Pasquotank County..... | 7-5-1956 |
| East Chicago | | Spencer County..... | 4-19-1956 | Pender County..... | 5-16-1955 |
| Gary | | Stanford..... | 12-2-1955 | Perquimans County.... | 7-5-1956 |
| Hammond | | Trigg County..... | 10-5-1956 | Person County..... | 4-5-1955 |
| Crawfordsville..... | 4-20-1955 | Union County..... | 5-7-1956 | Pitt County..... | 4-20-1955 |
| Elkhart, Goshen, Nappance area..... | 1-11-1956 | <i>Mississippi</i> | | Sampson County..... | 8-27-1956 |
| Greencastle..... | 1-4-1956 | Columbus..... | 9-19-1956 | Scotland County..... | 5-30-1956 |
| Indianapolis and Marion County..... | 8-13-1956 | Eupora..... | 2-23-1956 | Tyrrell County..... | 8-5-1955 |
| La Fayette..... | 9-7-1956 | Greenwood..... | 4-25-1956 | Washington County.... | 8-5-1955 |
| Lake County..... | 5-1955 | Grenada..... | 11-15-1955 | Wilson County..... | 10-18-1955 |
| Crown Point | | Houston..... | 6-1-1955 | <i>Oklahoma</i> | |
| Highland | | Inka..... | 7-19-1955 | Ardmore..... | 4-13-1956 |
| Hobart | | Kosciusko..... | 8-10-1955 | Bartlesville..... | 3-8-1955 |
| La Porte..... | 5-25-1956 | Laurel..... | 7-12-1956 | Guthrie..... | 5-22-1956 |
| Madison..... | 8-1955 | McComb..... | 8-2-1956 | Mangum..... | 10-27-1955 |
| Monticello..... | 12-6-1955 | Meridian..... | 6-18-1956 | Okmulgee..... | 5-8-1956 |
| Peru..... | 2-1955 | New Albany..... | 1-18-1956 | Sulphur..... | 2-9-1956 |
| Salem..... | 6-28-1956 | Oxford..... | 12-14-1955 | Tahlequah..... | 5-1-1956 |
| South Bend..... | 3-8-1956 | Picayune..... | 11-4-1955 | Tulsa..... | 5-23-1956 |
| Terre Haute..... | 2-3-1955 | Starkville..... | 3-26-1956 | <i>Tennessee</i> | |
| Vincennes..... | 3-7-1955 | West Point..... | 5-26-1955 | Bristol..... | 11-3-1955 |
| <i>Kentucky</i> | | <i>Missouri</i> | | Clarksville..... | 2-10-1955 |
| Anderson County..... | 5-17-1956 | St. Joseph..... | 6-9-1955 | Clinton..... | 5-29-1956 |
| Bardstown..... | 3-1955 | St. Louis..... | 11-28-1955 | Columbia..... | 6-7-1956 |
| Benton..... | 6-7-1956 | <i>Nevada</i> | | Cookeville..... | 9-21-1955 |
| Bowling Green..... | 11-17-1955 | Ely, McGill, and Ruth.. | 4-19-1955 | Elizabethhton..... | 2-23-1955 |
| Breckenridge County.. | 5-31-1956 | Yerington..... | 11-21-1955 | Fayetteville..... | 6-7-1956 |
| Cadiz..... | 10-5-1956 | <i>North Carolina</i> | | Franklin..... | 5-3-1956 |
| Campbellsville..... | 4-8-1955 | Beaufort County..... | 3-31-1955 | Greeneville..... | 6-19-1956 |
| Eddyville..... | 6-5-1956 | Bertie County..... | 3-31-1955 | Humboldt..... | 6-19-1956 |
| Falmouth..... | 4-26-1956 | Bladen County..... | 6-6-1955 | Jackson..... | 6-20-1956 |
| Frankfort..... | 7-23-1955 | Camden County..... | 7-5-1956 | Jefferson City..... | 8-20-1956 |
| Fulton..... | 12-23-1955 | Charlotte..... | 5-7-1956 | Kingsport..... | 11-9-1955 |
| Georgetown..... | 10-16-1956 | Chatham County..... | 4-5-1955 | Knoxville..... | 8-26-1955 |
| Greenville..... | 6-6-1956 | Chowan County..... | 7-5-1956 | Lewisburg..... | 11-21-1955 |
| Hardinsburg..... | 5-31-1956 | Craven County..... | 1-20-1956 | Livingston..... | 6-8-1956 |
| Hopkinsville..... | 11-17-1955 | Cumberland County.... | 3-16-1956 | Loudon..... | 5-24-1956 |
| Lawrenceburg..... | 5-17-1956 | | | Manchester..... | 10-12-1956 |
| | | | | Memphis..... | 6-29-1955 |
| | | | | Milan..... | 6-19-1956 |
| | | | | Morristown..... | 8-20-1956 |
| | | | | Murfreesboro..... | 7-14-1955 |

Patients in Nursing Homes and Their Care

NURSING HOMES have emerged to fill a particular set of needs. As they exist today, they respond as much to social needs as to medical needs. The impelling problem is that of accommodating and caring for people who require personal and nursing attention not forthcoming in their own homes or in the homes of relatives. Sometimes this entails a type of care which can be given properly only by trained personnel operating in a special facility such as the nursing home. Sometimes the care required is of a sort which might be possible in one's own home but is not feasible for the particular family or is simply not the desired arrangement. The sheer medical needs for a certain type of care have been reinforced by many physical and social pressures in contemporary life to produce the specialized institution known as the nursing home.

As a relatively new type of facility, the nursing home is not yet clearly conceived and understood. Need for better understanding the role of the nursing home and similar facilities in caring for the chronically ill led the Commission on Chronic Illness and the Public Health Service to join forces in a fact-finding study. To gain the desired insight into the character of nursing homes, the study focused on (a) what type of patients are in existing homes and (b) what type of care these patients receive.

Thirteen States in various parts of the country elected to participate in the survey conducted during 1953 and 1954. These were: California, Colorado, Connecticut, Georgia, Indiana, Maryland, Minnesota, New Mexico, upstate New York, Oklahoma, Rhode Island, Vermont, and Wyoming. Each State performed its own field work and processed and tabulated the data, employing uniform schedules and procedures which were outlined in a manual. Although a technically representative sample was not devised for the study, the consolidated results were found on examination to



Public Health

MONOGRAPH

No. 46

The accompanying summary covers some of the principal findings presented in Public Health Monograph No. 46, published concurrently with this issue of Public Health Reports. The 13-State survey upon which the report is based was a joint project of the Commission on Chronic Illness and the Public Health Service. At the time of the study, the authors of the monograph were associated with the Commission on Chronic Illness and the Division of Hospital and Medical Facilities, Public Health Service. Three of the authors are currently associated with other health and medical care organizations.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of major universities and in selected public libraries.

...

Salon, Jerry; Roberts, Dean W.; Krueger, Dean E.; and Baney, Anna Mae: *Nursing homes, their patients and their care: A study of nursing homes and similar long-term care facilities in 13 States.* Public Health Monograph No. 46 (PHS Publication No. 503). 58 pp. Illustrated. U. S. Government Printing Office, Washington, D. C., 1957. Price 40 cents.

| <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> |
|--|---------------------------|--|---------------------------|--|---------------------------|
| <i>Texas</i> | | <i>Texas—Continued</i> | | <i>Texas—Continued</i> | |
| Amarillo, 99.3----- | 4-11-1955 | Lubbock, 99.4----- | 6-14-1956 | Seminole, 93.9----- | 5-11-1955 |
| Brenham, 94----- | 6-13-1956 | McAllen, 99.2----- | 11-21-1955 | Waco, 99.76----- | 3-19-1956 |
| Brownsville, 98.3----- | 6-28-1956 | Mercedes, 99----- | 11-21-1955 | | |
| Childress, 83.4----- | 4-22-1955 | Paris, 98----- | 2- 2-1956 | <i>Virginia</i> | |
| Fort Worth, 99.98----- | 2-29-1956 | San Angelo, 99.7----- | 9- 1-1955 | Charlottesville, 99.4----- | 10-17-1955 |

NOTE: In these communities the pasteurized market milk shows a 90 percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90 percent or more com-

pliance with the grade A raw milk requirements, of the milk ordinance suggested by the United States Public Health Service.

Note particularly the percentage of the milk pasteurized in the various

communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

Training in Bioassay of Polluted Waters

A training course in the use of aquatic organisms for measuring and interpreting water pollution will be held May 6-10, at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio. It will be followed on May 13 and 14 by a training course in the bioassay of toxic wastes.

The biology of polluted waters course features basic instruction in the nature of various organisms and their response to pollution. The lectures, discussions, and laboratory demonstrations will emphasize new information and new applications and interpretations of data now in use. Professional and technical personnel dealing with aquatic biology are eligible for enrollment.

The course in the bioassay of toxic wastes deals with the effects of the steadily growing quantity, variety, and complexity of wastes on fish and other organisms. Study of these effects often opens the way for evaluation of toxicity so that suitable management practices may be instituted, even if the precise composition of the waste is unknown.

Trainees completing the course will be prepared to set up and run a basic bioassay program.

Applications and further information on both courses may be requested from Harry P. Kramer, Chief of Training Program, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati 26, Ohio.

One-fourth had been established only within the preceding 2 years. Nonproprietary nursing homes, on the whole, date back longer, as do the chronic disease hospitals.

Public Health Monograph No. 46 analyzes these and other major findings for each of the types of facilities surveyed, that is, proprietary nursing homes, nonproprietary (voluntary and

public) nursing homes, domiciliary care homes, and chronic disease hospitals. Comparisons are drawn wherever possible among the various groups of establishments. The appendix material includes an examination of the representativeness of the States in the sample and detailed tables giving basic data for each type of facility, by State.

Liability of State as Manufacturer and Distributor of Antitoxin



Gielski v. State, 155 N.Y.S. 2d 863 (N.Y. Ct. Cl., 1956) involved a claim against State of New York under the State Court of Claims Act.

Claimant suffered injury to his finger and was hospitalized for tetanus. His physician gave him an intraspinal administration of tetanus antitoxin manufactured and distributed by the division of laboratories and research of the New York State Department of Health. Claimant suffered injury as a result of that treatment. He alleged the intraspinal administration was made in reliance on, and in accordance with, a circular published, printed, and distributed by the State containing instructions and directions for use of the tetanus antitoxin and recommending intraspinal administration. It is alleged that the circular was negligently prepared in that medical specialists in treatment of tetanus did not regard intraspinal administration as safe, and that the circular was prepared and circulated with knowledge and intention that the medical profession would rely on and act on the information therein.

Issue: As a prerequisite to the court's further consideration of the claim under the act, it was necessary that the facts show a legal cause of action.

Holding: The court held the allegations (assumed for this purpose to be true) stated a cause of action, saying:

"The manufacture and distribution of an article dangerous to human life and well being if improperly used, imposes an obligation to advise of the manner in which the article may

be safely used. *Marcus v. Specific Pharmaceuticals, Inc.*, Sup., 82 N.Y.S. 2d 194. Since the obligation to give advice exists it is a necessary corollary that such advice must be given with care. The fact that the instrumentality was distributed only to members of the medical profession for use by them cannot serve to insulate the manufacturer and distributor from liability to the patient as a matter of law. *Wechsler v. Hoffman-Laroche, Inc.*, 198 Misc. 540, 99 N.Y.S. 2d 588."

The court referred to a previous ruling in blood plasma cases where use of plasma collected by the Red Cross and distributed by the New York State Department of Health resulted in death. In the plasma cases it was ruled that where the health department acted merely as a distributing agent of a product for which physicians were generally chargeable with knowledge of appropriate circumstances for use (and it was established in the trials that dangers inherent in use of blood plasma are widely known in the medical profession) the State was not liable to give further information or warning to the physician on the use of the product.

The court said in the *Gielski v. State* case that up to this point in the proceedings no proof as to the knowledge with which the physician is chargeable concerning the use of tetanus antitoxin had been presented, and a physician is chargeable only with such skill and learning ordinarily possessed by physicians in the locality. The court said the circular gave the appearance of reflecting generally accepted medical practice.

present a fairly adequate picture of the Nation's nursing homes.

Information gathered on the patients included personal data, date of admission to the nursing home, diagnoses as available, nature and extent of disability, nursing and personal services received, physician's care, charges, and sources of funds for payment. In addition, information on the length of time the homes had been in operation, their size, and the number and types of staff employed was also obtained. Data on these factors and their interrelationships are presented in detail in the monograph.

The central focus of the study is the proprietary nursing home, which has increased so rapidly in numbers in the last two decades. To perceive in better perspective the role of this relatively new and now quite numerous type of facility, some of the States also surveyed such similar types of long-term care facilities as nonproprietary (voluntary and public) nursing homes, domiciliary care homes, and chronic disease hospitals.

Types of Patients

The findings of the survey reveal that both similarities and differences exist among these categories of institutions, depending upon the emphasis that is given. Basically, it can be said that all of these types of facilities are alike in an important characteristic: They all serve very aged people, predominantly. A large majority of the people in each type of institution are past 65 years of age. With this similarity, significant differences may nevertheless be observed in the age makeup of patients in the four types of facilities studied. Data for five States which surveyed all categories of facilities show that, whereas in proprietary nursing homes as many as 90 percent of the patients are past 65 years of age, in the chronic disease hospitals only about 65 percent are that old.

With respect to the extent of disability among the patients, proprietary nursing homes and chronic disease hospitals serve the groups who are most disabled; voluntary and public nursing homes, those who are, in general, less disabled; and domiciliary care homes, the least disabled group. This gradient is also reflected in the types and extent of services received in the sev-

eral categories of facilities. For example, relative to the other facilities, a higher proportion of the patients in proprietary nursing homes and chronic disease hospitals receive various nursing and personal services.

Information on the length of time spent in the facilities up to the date of the survey revealed that the average patient in a proprietary nursing home had already spent about a year in the present home, the shortest period of residence found among the four types of establishments. Patients in chronic disease hospitals and nonproprietary nursing homes had been in these institutions for somewhat longer periods, and the residents of domiciliary care homes had an average stay to date of more than 2 years.

Such long periods of care naturally impose a severe financial drain on many patients and their families. It is therefore not surprising to find that public welfare funds pay for the care of about half of all patients in proprietary nursing homes. Similarly, large proportions receive such assistance in the other types of homes. Although public assistance does not play quite as large a role among patients in the chronic disease hospitals surveyed, other resources, such as voluntary agencies (including those operating hospitals) and public auspices other than public assistance funds, are financing the care of nearly half of the patients in these hospitals.

Staffing and Age of Homes

Nursing homes without professionally trained nurses are very common. Approximately 60 percent of all proprietary nursing homes have not a single professional nurse on their staff. In a few States where licensure requirements specify high staffing standards, however, nursing homes commonly have at least a supervising registered nurse. Interestingly, voluntary and public nursing homes, although their residents are generally less ill and disabled than the group found in proprietary nursing homes, maintain a higher standard—less than one-fifth of the nonproprietary nursing homes do not employ a professional nurse.

That proprietary nursing homes are still a relatively new phenomenon is demonstrated by the recent origin of many of the existing homes.

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frontispiece

The municipal sewage treatment plant at Coral Gables, Fla., is decorated by a mural, the work of John St. John. The plant is south of Miami on U. S. Route 1.

technical publications

National Institutes of Health

PHS Publication No. 81. Revised 1956. 25 pages. 25 cents.

The 1956 revised brochure briefly presents the history and programs of the National Institutes of Health, citing significant advances of the individual institutes, divisions, and the Clinical Center.

Recent changes in the structure of NIH are outlined. These include reorganization and expansion to provide a Division of Biologics Standards, the National Institute of Allergy and Infectious Diseases, the Division of Research Services, and the Division of Business Operations. The last two divisions centralize supportive services at NIH.

The pamphlet is designed to reflect the underlying philosophy of the programs conducted by each NIH component. It also illustrates the integration of these programs and the "team approach" characteristic of medical research today.

Four Decades of Action for Children

Children's Bureau Publication No. 358. 90 pages. 35 cents.

Your Children's Bureau

Children's Bureau Publication No. 357. 48 pages; illustrated. 20 cents.

The history of the Children's Bureau and its current program of action for children are contained in two new publications, primarily designed for the wide spectrum of professional workers and lay leaders who want more than a nodding acquaintance with their Government's services for children.

Four Decades of Action for Children shows how the Bureau's responsibilities have grown from its orig-

inal mandate of investigating and reporting on the welfare of children to inclusion of assistance to States, through administration of Federal grants, in expanding and improving their services for children.

Your Children's Bureau describes how the bureau presently works to advance the well-being of all children and especially of disadvantaged children, through its own programs and in collaboration with others in and out of Government.

Procedures for Isolation and Identification of the Gonococcus

PHS Publication No. 499. 1956. 36 pages; illustrated

Originally VD Graphic 84, this 1956 reissue of the manual outlines laboratory techniques for isolation of the gonococcus. It describes materials and media used; how specimens are taken from males and females; preparation of smears; procedure for the isolation of the gonococcus by culture and for performing the fermentation test; and, the identification of *Neisseria gonorrhoeae*. A pictorial diagram shows suggested steps to be followed in this latter technique.

Selected References On Cardiovascular Disease

Annotated bibliography for nurses

PHS Publication No. 472. 1956 52 pages. 25 cents.

Compiled as a time-saving guide for nurses, this annotated bibliography on cardiovascular diseases will also be of use to medical students, nutritionists, health educators, social workers, and others in the health field concerned with heart disease.

References are arranged in sections according to major interests in the field such as rehabilitation, emotional aspects, and patient education. Films and other audiovisual aids are also listed.

The Child Who Is Mentally Retarded

Children's Bureau Folder No. 43. 23 pages; illustrated. 10 cents.

The latest in a series of folders addressed to parents whose children have crippling conditions, "The Child Who Is Mentally Retarded" sets forth some of the home training that parents can give a retarded child. It stresses the fact that retarded children have the same feelings as other children and that most are as sensitive as any other child.

The folder emphasizes, as a springboard for planning, the value of a thorough diagnostic evaluation for a child who appears to be mentally retarded. It also outlines some of the factors which parents would want to consider in deciding either to keep the child at home or place him away from home.

Also described are some of the community agencies and national groups to which parents may turn for help with their individual problems.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Scientific evidence indicates that immunization schedules and doses can be varied to fit the conditions of agricultural migrants and other special groups without impairing effectiveness.

Adapting Immunization Programs to Special Groups

By ARTHUR L. TUURI, M.D., HELEN L. JOHNSTON, and DONALD HARTING, M.D.

IMMUNIZATION programs generally follow fixed routines. These fit the convenience of physician and patient and conform to desirable patterns of well-child supervision under ordinary circumstances. For people on the move and for people living in areas remote from health services, conventional patterns may not be applicable. Health workers who attempt to follow them may earn only frustration for their effort.

What flexibility in immunization schedules is permissible under special circumstances? To what extent can time intervals between injections or size of doses be varied without endangering program effectiveness?

This article looks at the problem from the specific point of view of the need for adapting immunization programs to fit the special con-

ditions of agricultural migrants. It reviews recent information regarding the immunization status of the general population, as well as that of migrants. It also summarizes recent evidence of the possibilities of varying immunization procedures to fit special circumstances. Although the article was prepared primarily with the needs of agricultural migrants in mind, the possibilities of varying schedules obviously have wider application if circumstances warrant.

Agricultural migrants in the United States number about three-quarters of a million persons, including both workers and dependents who accompany them. Each year, they move from one area to another to help produce and harvest the Nation's crops. An area may depend on them for its economic existence. Yet local communities may reject them, in part because of the fear that they may be disease carriers.

The mobility of migrant workers in agriculture and their brief convergence on areas that may be far removed from population centers are among the factors that make it difficult for health workers to extend services to these people. Services provided in the usual places and ways and at the usual hours are likely not to reach them.

Temporary arrangements for provision of health services at times and places convenient

Dr. Tuuri, pediatric consultant, Division of General Health Services, Public Health Service, has participated in programs for migrants and Indians, two groups difficult to reach by conventional public health programs. Miss Johnston is staff adviser in the field of rural health, and Dr. Harting is chief of the Program Development Branch, Division of General Health Services.

Important contributions to this paper, especially concerning diphtheria, were made by Dr. Alexander Langmuir and Dr. Helen Moore, Communicable Disease Center, Public Health Service, Atlanta.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE
LEROY E. BURNET, *Surgeon General*

sibility that they may contract and carry disease from one place to another are matters of concern.

Two outbreaks of diphtheria were reported among people living in migrant labor housing during the first 6 months of 1956 (2). During 1955, an outbreak of chickenpox among migrant workers in Lee County, Ill., led to an investigation by the Illinois Department of Public Health. A report from the county states: "A minority of the entire personnel showed evidence of previous smallpox vaccination, and only a few of the children had ever received immunization against diphtheria, pertussis, or tetanus" (3).

A Colorado study based on interviews of 260 migrant families, including 1,153 adults and children, during 1950 indicates that only 42 percent had had smallpox vaccination and probably only 1 out of 5 or fewer were immunized against diphtheria, whooping cough, or tetanus (4). Informal reports from several Colorado nurses who are working with agricultural migrants are in accord with these findings. Health workers in other areas have made similar reports.

In some of the labor camps and fringe areas of population centers where agricultural migrants live for brief periods, living conditions

are primitive. Occasional outbreaks of typhoid fever occur. This situation is believed to warrant consideration of immunization against typhoid fever for agricultural migrants even though this is not advocated for the general population under ordinary conditions.

State Immunization Policies

The Committee on the Control of Infectious Diseases of the American Academy of Pediatrics recommends that combined immunizations against diphtheria, pertussis, and tetanus be given "at intervals of not less than 1 month and preferably not more than 3 months" (5). The States and Territories are using this standard to an increasing extent in setting policies for their immunization programs. States continue to vary, however, in their policies and in the standards to which they refer.

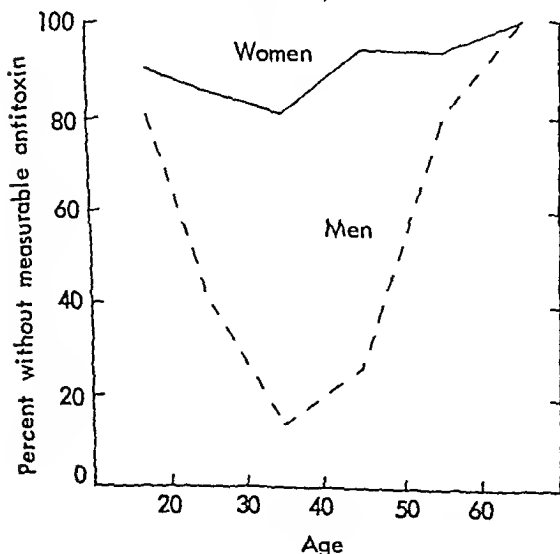
This State-to-State variation in itself suggests that flexibility in immunization programs is possible. However, the policies in each State, whether or not set by law, have frequently been translated into long-standing practices that are strictly adhered to in immunization programs whether the programs are carried out in the offices of private physicians or in public clinics.

In comparing State immunization policies, Eliot noted that 22 States and 1 Territory set the maximum permissible time interval between injections in the primary DPT series at 1 month. No flexibility is permitted in this time interval. Two States and two Territories permit an interval of 3 months between primary injections, and 3 States permit a 4-month interval. Eight States and one Territory, on the other hand, permit an interval of 6 months between injections without requiring that the series be restarted (6).

Effect of Lengthened Time Interval

Opinions differ as to the levels of antitoxin in the blood serum necessary to confer immunity against diphtheria and tetanus. The evidence available, however, points to as high or higher levels of antibody response when the interval between doses is prolonged as when the interval is the length usually recommended for primary immunization. Jones pointed out

Figure 2. Tetanus immunity among adults, Massachusetts, 1954.



SOURCE: Reference 1.

to both the workers and their employers may sometimes be possible. Immunization services, however, differ from most others in that there is a general belief that fixed time schedules must be followed if immunization is to be effective. Many health workers hesitate to initiate a series of primary injections unless they are sure that they can complete the series in accordance with the customary time schedule.

The frequently severe reactions among adults to the usual doses of antigens also deter immunization programs among migrants. The reactions in adults may cause great discomfort and even loss of time from work at a period which is crucial for both workers and employers. Such problems, of course, are not peculiar to the agricultural migrant population.

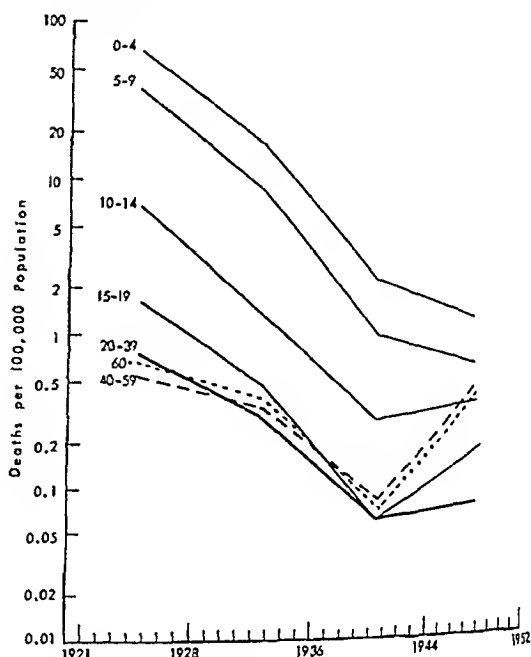
Immunization Status

The available information concerning the immunization status of the population is chiefly in terms of the continued occurrence of diseases for which effective control techniques have long been known. Diphtheria, for example, has long been subject to control by immunization. Yet data compiled by the Communicable Disease Center, Public Health Service, show that more than 2,000 cases of diphtheria occur each year over the Nation as a whole.

Special studies seem to indicate a shift in the importance of diphtheria from the younger to the older age groups. A long-term study of age-specific mortality rates in Massachusetts shows that diphtheria mortality rates among children under 10 years of age have declined throughout the period 1921-53. In other age groups, however, the long-term decline was interrupted in the early 1940's, as shown in figure 1 (1). More than half the cases of diphtheria in California during the period 1950-54 were among persons over 19 years of age, according to Communicable Disease Center data. In the southern States, the shift in the importance of diphtheria from younger to older age groups is much less prominent, although this region, too, shows some increase in the proportion of cases in age groups over 19 years.

Some of the southern States, including Texas, have reported more cases and a greater number of diphtheria outbreaks than other parts of the

Figure 1. Diphtheria trends in age-specific mortality in 8-year periods, Massachusetts, 1921 through 1952.



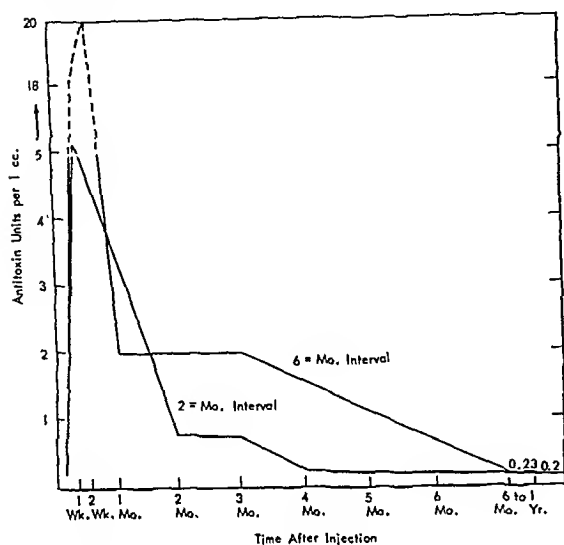
SOURCE: Reference 1.

country in recent years. Data for these States show that diphtheria among the nonwhite population is on the increase. These same States supply a large segment of the labor force that annually moves northward from one crop harvest to another.

To a somewhat lesser extent than diphtheria, tetanus continues to be an important problem. The proportion of cases among children and young adults has decreased in recent years. These are the groups most extensively reached through immunization programs for young children and for military personnel. The proportion of cases among older adults, however, has been gradually increasing. According to a Massachusetts study in 1954, more than one-half of the persons over 20 years of age had antibody levels of less than 0.01 units of antitoxin. Women had significantly lower antibody levels than men, as shown in figure 2 (1).

How much the situation among agricultural migrants may deviate from that in the general population is not known. In the opinion of public health workers and others familiar with the situation, however, migrants' lack of protection through immunization and the pos-

Figure 4. Comparison of 6-month interval and 2-month interval between first and second injections of combined alum precipitated diphtheria and tetanus toxoid as to titers of tetanus antitoxin.



SOURCE: Reference 8.

the use of triple antigens with injections from 6 to 12 months apart are at least as good as the levels obtained when the antigens are given at intervals of from 1 to 4 weeks.

There is also evidence that when the time interval between primary injections is increased, a higher immediate antibody level is produced by a stimulating, or secondary, injection given 3 months to 7 years later (8, 9).

In infants studied, there was no relationship between a poor initial response and the recall response obtained years later with diphtheria and tetanus toxoids. It appears that adequate recall response can be expected in most cases in spite of poor initial response (10). The majority of adults will show protective antibody levels within 6 days after a recall dose of tetanus toxoid as long as 10 years after primary immunization (1, 12, 13).

Taken together, these data suggest that the usual telescoping of injection schedules has value chiefly for the convenience of physicians and patients, for emergency situations (1), or for producing immunity in infants as rapidly as feasible at a time when the hazards are likely to be the greatest for the infant. Many immunologists believe that ineffective immuniza-

tion is more likely to result from relatively short intervals between doses than from long intervals.

Methods of Reducing Untoward Reactions

Three methods of decreasing severe reactions to diphtheria toxoid among adults are to immunize only susceptibles as determined by the Schick test, to use purified toxoids, or to decrease the dose of toxoid. The first, of course, might not be feasible for a seasonal farm worker since he might be on his way to another work location by the time the results of the test were known. The second decreases the incidence of reactions only in age groups under 30 years (14).

On the basis of present evidence, the most effective means of decreasing untoward reactions in diphtheria immunization is by decreasing the dose of toxoid. Small doses of diphtheria toxoid (in the range of 1 Lf per dose) can be used to immunize adults successfully without regard to selection of Schick positive individuals (11). Only occasional reactions are encountered with 1-Lf doses (table 1).

Table 1. Reactions to 1-Lf diphtheria toxoid

| Degree of reaction | Number of subjects | | | |
|--------------------|--------------------|------------------|------------------|------------------|
| | Local reaction | | General reaction | |
| | FTT ¹ | APT ² | FTT ¹ | APT ² |
| None..... | 5 | 39 | 42 | 71 |
| Mild..... | 27 | 31 | 8 | 2 |
| Moderate..... | 14 | 4 | 5 | 0 |
| Severe..... | 10 | 1 | 1 | 2 |
| Total..... | 56 | 75 | ----- | ----- |

¹ FTT=fluid toxoid, in tetanus toxoid.

² APT=AIPO₄—adsorbed toxoid.

SOURCE: Reference 11.

In studies conducted by the Commission on Immunization of the Armed Forces Epidemiological Board with doses of 1 Lf (in 0.5 cc.), less than 5 percent of the patients had systemic reactions. (The vaccine usually used in immunizing children contains 20-25 Lf/cc.) Although there has been some question as to the

that by increasing the interval between injections for immunization against diphtheria, a higher antibody response is seen (7). Similar findings of higher antibody levels with longer intervals between tetanus immunizations have been reported by Bigler and Werner (8), Bigler (9), and Deamer and associates (10).

In a controlled study in which an interval of 6 months or more between first and second primary diphtheria and tetanus immunizations was compared with a 2-month interval (figs. 3 and 4), Bigler and Werner found that the immediate antibody response averaged 4 times higher for the longer interval than for the shorter (8).

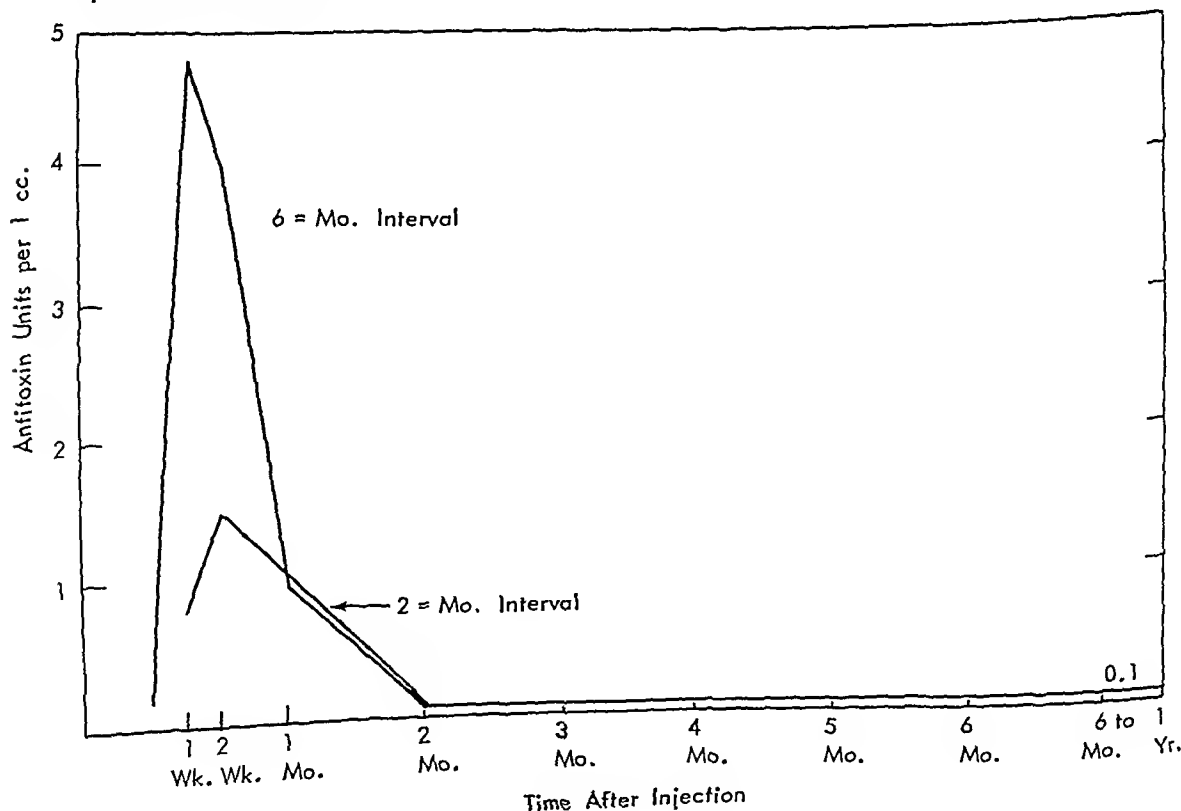
In a group of children receiving primary tetanus injections at intervals of from 6 to 51 months, Bigler noted that 6 months after the final injection the titers were in the same range as those present in children receiving primary

injections at intervals of from 1 to 3 months (9). Deamer and his co-workers confirmed the findings of a higher tetanus antitoxin response in infants when the interval between injections was lengthened (10).

Ipsen noted a satisfactory antibody response in the tetanus antitoxin titer in previously unimmunized adult men who were given small doses of toxoid (5 Lf) at an interval of 23 weeks between the first and second primary injections (1). Edsall and his associates demonstrated diphtheria antibody titers greater than 0.03 units per milliliter in 250 of 252 patients given 1-Lf doses of adsorbed diphtheria toxoid with a 5-month interval between the second and third doses (11).

According to Dr. J. H. Lapin, attending pediatrician, Bronx Hospital, New York City, other investigators report that antibody levels for diphtheria, tetanus, and pertussis following

Figure 3. Comparison of 6-month interval and 2-month interval between first and second injections of combined alum precipitated diphtheria and tetanus toxoid as to titers of diphtheria antitoxin.



SOURCE: Reference 8.

summarizes evidence that the use of small doses of antigens is effective in minimizing untoward reactions; at the same time, these small doses produce adequate antibody response. The small doses also lend themselves to use in a combined vaccine, thus decreasing the number of injections required.

If the usual patterns followed in immunization programs can be conveniently fitted to any group, including agricultural migrants, no change in these patterns is suggested. However, permissible variations, such as those reviewed in this paper, need to be considered in order to tailor programs to groups which are difficult to reach by conventional means.

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Table 2. Diphtheria antitoxin titer in adult men before and 1 week and 3 weeks after one injection of 1-Lf diphtheria toxoid

| Titer before booster | Alum-toxoid antitoxin titer | | | Fluid-toxoid antitoxin titer | | |
|----------------------|-----------------------------|-----------|------------|------------------------------|-----------|------------|
| | Number patients | At 1 week | At 3 weeks | Number patients | At 1 week | At 3 weeks |
| 0.001----- | 1 | 0.10 | 3.2 | 0 | ----- | ----- |
| 0.001-0.01----- | 3 | .32 | 2.1 | 4 | 0.10 | 1.3 |
| 0.01-0.1----- | 8 | .56 | 4.2 | 8 | .49 | 10.0 |
| 0.1-1.0----- | 19 | .81 | 4.8 | 25 | 1.9 | 11.0 |
| 1.0----- | 6 | 3.20 | 4.7 | 3 | 3.2 | 15.0 |
| Total----- | 37 | ----- | ----- | 40 | ----- | ----- |
| Average----- | ----- | .84 | 4.3 | ----- | 1.06 | 9.0 |

SOURCE: Reference 1.

effectiveness of these small doses as a primary antigenic stimulus, they are known to be effective as a recall dose for maintaining a satisfactory immunity level (1, 11, 15). Results obtained with 1-Lf doses in two studies are given in table 2 and figure 5.

In immunization against typhoid fever, systemic reactions can be reduced considerably and protective levels of antibodies can be achieved by intracutaneous administration of typhoid-paratyphoid vaccine (16-18).

Combined Antigens

For the past 5 years, the Canadian Armed Forces have used a vaccine containing typhoid, paratyphoid, tetanus (8 Lf), and diphtheria (4

Lf) antigens. The results of studies of this vaccine compare favorably with data relating to children who have received 3 doses of fluid toxoid (19). The vaccine proved effective both as a primary stimulus and as a secondary stimulus and provided antibody levels as high as 3 doses of plain toxoid.

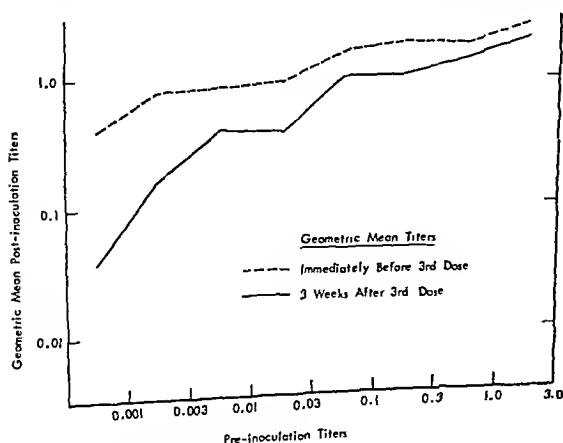
Use of such a combined vaccine would greatly simplify immunization procedures among adults in the agricultural migrant population since it would decrease the number of injections by about one-third. In addition, as indicated by the preceding information concerning lengthened time interval, the interval between injections may be increased far beyond the conventional limits with satisfactory results.

Summary

Agricultural migrants and other mobile or isolated population groups have long frustrated health workers' efforts to fit them into conventional immunization programs. All too frequently, the belief that any deviation from standard procedures would preclude an adequate immune response has led health workers to avoid attempting to initiate immunization procedures when conditions would not permit following the usual patterns.

This paper reviews evidence which refutes the frequently held view that if the doses of antigens cannot be given at the usual time intervals, or if one injection is omitted, the entire series of primary injections must be restarted and completed in the usual sequence in order to attain effective immunization levels. It also

Figure 5. Relationship of postinoculation titers to preinoculation titers following two and three 1-Lf doses of adsorbed diphtheria toxoid.



SOURCE: Reference 11.

privations, or until the advantages of death seem to outweigh the burdens of life. Life is, indeed, precious to the old.

- To get more rest, or, perhaps, to get release from the necessity of wearisome exertion at humdrum tasks and to get protection from too great exposure to physical hazards—opportunities, in other words, to safeguard and preserve waning physical energies. Old people have to learn to hoard their energies.

- To remain active participants in group affairs in either operational or supervisory roles, any participation being preferable to idleness and indifference. "Something to do, and nothing to be done," is perhaps the main idea.

- To safeguard or even strengthen any prerogatives acquired such as skills, possessions, rights, authority, and prestige. The aged want to hold on to whatever they have. Seniority rights are zealously guarded.

- Finally, to withdraw from life, when necessity requires it, as honorably and comfortably as possible and with maximal prospects for an attractive hereafter.

These five interests—longer life, rest, participation, prerogatives, an easy and honorable release—probably can be subsumed under the two words "influence" and "security" if they are used with broad connotations.

We have observed impressive uniformity in these interests regardless of time and place.

But the ways of adjusting to, and the appraisals of, aging show very wide variations. In short, what we oldsters want is simple and clear, but how to get it is complex. It would seem, indeed, that every conceivable adjustment has been tried out by people somewhere in their attempts to enrich and round off the last years of life.

In worldwide perspective, old age may be said to begin relatively early or late in life and to last a long or short time. Its coming may be resented and discounted or welcomed and treasured. Some people actually try to "hurry up and get there," while others postpone it to ridiculous degrees.

When it does come it may be regarded as an idle and useless period or as an active and fruitful one. It may bring promotions in position and homage with the years or demotions and degradations. It may drag itself out in dull,

t tedious boredom or go by quickly and with zest.

The people in one society may look forward to a full and ripe old age; in another, next to none at all; and in still another, to long and empty spans of timepassing. Some may beg to be put away honorably, and others may long to live on even in their misery. Thus, from place to place and from time to time, aging may be viewed as a curse on the one hand or as a challenge on the other.

Here is a generalization, though, that seems to hold universally: Every human being has had either to die or grow older and, in this dilemma, the social and cultural factors have been extremely important.

Very significant aspects of the social and cultural factors in aging are the inculcated patterns of interpersonal privileges and responsibilities that require or inspire the young and the sly to respect and to provide for the old and the feeble.

All the evidence indicates that these patterns of behavior are not inborn; they are built into the culture. It is almost a maxim that man is the only animal that can be made, willy-nilly, to take care of his grandfather.

Nature in the raw has never been very kind to old age anywhere and in any species. Security for old age is distinctly a human-culture achievement. The taming and the use of fire is a simple example of how man's material culture can serve and comfort the aged. When fire was finally brought under control, used as a defense against climate and wild animals, applied to the manufacture of implements and the preparation of food, and made a stabilizing factor in family life, with its warm hearth and cozy corner, a new day had dawned for the elders. Indeed, the advantages of fire were soon so closely associated with the frailties of age that when the necessity arose to abandon an old and enfeebled relative it became a popular rite and last favor to leave him with a supply of food, a flame, and some fuel.

There are equally important examples of security for the aged in the development of social relations, such as rules obligating the young to respect, heed, and provide for the old in many and varied forms. Property rights are an outstanding example. But whether and how well any of this has been done depends greatly upon

AN ANTHROPOLOGIST

Views Old Age



By LEO W. SIMMONS, Ph.D.

OLD AGE may be viewed either as a problem or a challenge, and both socially and personally. I submit two quotations, one stressing the problem side and the other signifying the challenge.

Cato the Elder is reported to have said: "For my part, I prefer to be an old man for a somewhat shorter time, than to be an old man before my time." He saw the problem side.

One Joseph Choate concludes that people are really happiest in their seventies and eighties, so his advice is, "Hurry up and get there." He sees the challenge.

However we look at it, we are confronted with the plain fact of a spectacular increase of old people all around us. We can see these old people in the present or we can study them in the past.

My own interests have led me more toward the cross-cultural and worldwide views on aging than to the specifics of our present times.

It has been very helpful to look for the uniformities and the common elements that underlie the experience of old age in different times and places. One way to state this issue is to

ask: What is new and different, really, and what is old and common to all mankind in this matter of aging? Answers to this question give us background, points of orientation, and they may also highlight the current issues of our own age.

Among many peoples in primitive and historical settings, I have looked for two things:

- The persistent or recurring interests of aging persons. What are their needs or what do they want, almost everywhere?
- The solutions that different societies have made to the problems of aging. What have different peoples done about the needs of aging? What solutions are most fundamental and widespread?

It turns out, as I see it, that the basic interests of aging persons appear to be more uniform than the solutions or the appraisals of these solutions.

What We Want

A careful survey over a long period of time of 71 different peoples, distributed worldwide, has disclosed recurring interests of aging persons that can be summed up pretty well in a five-fold way:

- To live as long as possible, or at least until life's satisfactions no longer compensate for its

Dr. Simmons, professor of sociology at Yale University, is noted for his studies in social anthropology and medical sociology. Among his publications is "The Role of the Aged in Primitive Society."

it. That is a long story that has to be skipped here.

The big point for us is that in primitive societies and, indeed in all societies until modern civilization, this over-age period has not been very significant. Few persons reached this stage; they didn't last long in it. Some were dispatched with varying degrees of dignity and prestige.



The helpless and hopeless period takes on paramount importance, however, in our own civilized times. We are so successful in keeping very old people alive that we don't know what to do with them. Imagine the magnified possibilities of living parts of aging bodies scattered around here and there! Add to this the recognized fact that the useless period is largely socially and culturally determined and that it may be moved up or put off in years. The problem thus becomes unpredictable and staggering.

The social fates are most unfortunate, of course, when so many old people are made to feel useless relatively early in life and to find the twilight years empty, lonely, and long lasting. More and more of life with less and less in it is not a happy prospect. Thus can civilization create more problems for aging than it has yet solved. Death is really the only ultimate solution. Whether life can be good to the last drop or not really depends on when and how we drop.

Our fourth lesson is that there is a pattern of participation for the aged that becomes relatively fixed in stable societies but suffers disruption with rapid social change.

We know that stable societies provide a structured framework for participation, with status and roles that are defined, sex typed, aptitude rated, and age graded. If the pattern stays fixed over many generations, the aging get a lifetime to fit in and entrench themselves.

Here is one way to express the general principle: In the long and steady strides of the social order, the aging get themselves fixed and favored in positions, power, and performance. They have what we call seniority rights. But

when social conditions become unstable and the rate of change reaches a galloping pace, the aged are riding for an early fall and the more youthful associates take their seats in the saddles.

The general pattern for the adjustment of the aged in society fits into five more or less social structures of human groups: (a) the economic order, (b) the family system, (c) the political system, (d) the religiomagical institutions, and (e) the socioeducational systems. It is a long and interesting story to document the changes imposed upon the aged in making adjustments to shifts in these five systems. In general, it can be said that change is the crux of the problem of aging as well as its challenge.

The fifth and last lesson is that the modern challenge is to explore and experiment anew with aging.

We have more aged persons than the world has ever known: 14 million in the United States 65 years old or more and 26 million anticipated by A. D. 2000. And these people are already born! Old age is beginning earlier, with more untapped and unused resources than in earlier times. The old tried and tested patterns of participation and security have been disrupted, and they are passing away.

Perhaps the most important lesson that can come out of the past is that the basic qualities of successful aging rest, after all, upon the capacities and opportunities of individuals to fit well into the social framework of their own times, and in ways that insure prolonged influence and security.



It may well be that there are no genuine substitutes for suitable adaptations and true contributions of ripe age. Certainly the challenge is to rediscover them for the modern world.

We are now accustomed to hearing much about the problems and little about the opportunities of aging, almost as if aging were a curse—and after all our efforts to attain it! It should be kept in mind that the prospect of so many of us reaching old age is in itself a most remarkable achievement, entirely unknown to earlier times. Let us not forget, therefore, that

the existing culture of the time and place and the organization of society itself.

It is noteworthy that in some societies such solicitude for the aged has seemed to fall squarely in line with the self-interest of the young. In such cases the solicitous youth could have said of his aid to his elders, truthfully and without pathos, "Grandfather, this helps (not hurts) me more than it does you." In other societies youth does not see such a connection. Why? The answer lies in the culture and the social organization.

Here is an important general principle to consider: Whenever society has provided a mutually supportive relationship between its youth and its elders, old-age security has had its firmest foundation. In contrast, the severest hazard of the aged and the infirm has been to find themselves cut off from the young and the able bodied upon whom they have had to rely. One could speculate that the time may come when youth can manage without the aged; but whatever widens the gap between the two will, more than likely, be at the expense of the latter, especially in the extremities of their dotage. There is no substitute for the ties that bind youth and age in common interests.

Five Lessons in Aging

From here on I will list a few simple lessons that I have learned about aging, five lessons in fact.

First, aging has become a complex and challenging proposition to face personally.

Let me illustrate this lesson with the mention of two common mistakes. The first mistake is to try to compare and to choose between old age and youth. We cannot do that. The choice, really, is between aging and dying. We've had our youth, some of us at any rate. Now, for us, it is age or else. The second mistake is to regard aging primarily as a time of resting, however much we think we like resting. "Old age for rest" is only a half truth at best. The efforts and the strategy of life had better go on, refined and intensified to be sure. Aging successfully is somewhat like riding a bicycle—to stop is to go down.

My second lesson in broad perspective is that aging can be good or bad, and when it is good

it generally is more of an achievement than a gift.

A person, of course, must get to be old before he can make it good, and most human beings have never been able to get there. The farther back we go in human society the earlier people became "old," but fewer and fewer old people are to be found back there.

There was a great surprise to me in my studies of aging. Societies solved the problems of a successful old age for a few long before they could assure any old age at all for the many. For a long time, in a few spots on earth, one has been able to say truthfully with Joseph Choate, the happiest years of life are in old age. So let's hurry up and get there. There are primitive peoples who frankly regard old age as the best part of life, and they try early to appear, and to be regarded as, older than they are.

Now we suspect that civilization has made the aging period for most of us something less than the best of life. All this ties in with the social determinants of when we become old, on what terms, and how long we are permitted to last. A secret of success for most people facing old age is to find for themselves places in society in which they can age with participation and fulfillment, and to keep on participating tactfully and strategically up to as near the end as possible. Aging must be gamey to the end to be very good.

The third lesson out of our broad background studies is that a stage is reached in aging everywhere in which social assessments of the condition are uniformly dismal.

Among all peoples a point is reached in aging at which any further usefulness appears to be over and the incumbent is regarded as a living liability. Senility may be a suitable label for this. Other terms among primitive peoples are the "over-aged," the "useless stage," the "sleeping period," the "age-grade of the dying," and the "already dead." Then, without actual death, the prospects are gloomy. There is no question about this generalized social decision; the differences lie in the point at which it is reached. All societies differentiate between old age and this final pathetic plight. Some do something positive about it. Others wait for nature to do it or perhaps assist nature in doing

This outline of the nature, basis, and method of eight interrelated surveys calls attention to the wealth of published material applicable to an evaluation of oral health needs and resources.

Planning Surveys To Assess a State's Oral Health Status

By DAVID F. STRIFFLER, D.D.S., M.P.H.

THE PUBLIC HEALTH dentist proceeds to assess the oral health status of his "patient," the State and its people, along much the same lines as does the dentist in private practice (1). First, he listens to his patient's chief complaint, and then he sizes up the patient and questions him. Next, he makes a clinical examination, using all the necessary diagnostic instruments. Finally, he records his findings so that he can analyze them and arrive at a diagnosis.

The survey, whether formal or informal, is the method the public health dentist uses to make his assessment. Surveys can serve many specific purposes. They can provide an accurate basis for identifying the real, as opposed to the apparent, oral health problems (2); guide the assignment of priorities in program planning and budgeting (3); provide baseline data for future program evaluation (4-8); supply data needed in anticipation of new pro-

grams, such as prepayment dental care plans (9-11); "determine the epidemiological characteristics of a dental disease . . . establishing the manner in which the disease is manifested in population groups . . ." (7).

We shall outline specific objectives and practicable procedures for eight types of interrelated surveys, all directed toward the assessment of the oral health status of a State and its people. We shall give attention also to special problems, for, as in the private dental office, emergencies frequently intrude to upset the best of planning. Finally, we shall consider plans for analyzing and interpreting the findings of these interrelated surveys.

General Rules

The following 6 rules apply to the planning of all 8 surveys:

1. For background information, study the literature on oral health needs and resources and on survey principles and procedures (1, 7, 12-15).

2. Consult with a statistician concerning sampling, coding, record forms, analyses of data, and how to present the findings.

3. Consult with another public health dentist, perhaps the regional Public Health Service consultant.

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our society and our community can, and probably will, create before long a brave new climate in which to grow old. That is part of the challenge that has inspired so much thought in recent times on the problems of aging. But it is only part of it. Perhaps even more important, and indeed more crucial, is the challenge of keeping before us a vision of what such an aging population can contribute to our modern way of life.

It is perhaps not amiss to remind ourselves again that in everyman's folkways, the world over, the plain folk have aged most successfully when they have discovered and developed for themselves effective places and functions in the very societies in which they are a part. It is very probable that within our highly complex civilization there lie all around us untapped potentials for aging that may be explored and fitted into our times. Herein lies an old frontier that invites new pioneering, and herein, also, lies the Holy Grail for aging.

Summary

The world has never before witnessed such a high proportion of people living on what has been called borrowed time. The problem and the challenge are greater for us than they were

for our forefathers or for our primitive forebears. We are emotionally confused and can't decide how long to stay young or when to get old. Most of us are really younger or older than we think.

In broad historical background, there is more agreement on what old people want than there is agreement on how to get it. Five wishes seem to be shared by aging people everywhere: to live as long as possible, to hoard their waning energies, to share in the continuing affairs of life, to safeguard their seniority rights, and to have as easy and honorable release from life as possible. How to get these five wishes fulfilled in later life has differed greatly around the world.

Human societies solved the problem of a successful old age for a few people long before there was any chance for old age for many people. The old solution to a successful old age was to find a useful and respected place in life and to fill it effectively until near the end—an end that came quickly.

Civilization has created more problems for the aged than it has solved. Now we insure more and more life with less and less in it. The challenge is to find new ways to put interest and zest in aging and for the aged.

Intensive Therapy Curtails Commitment

The enormous and growing population of aging persons has become a matter for extensive official concern in that half the residents of mental institutions are past 65. Controlled studies reported by Dr. Lionel Z. Cosin of Oxford, England, indicate that by setting aside relatively few beds for the intensive treatment of older persons with mental aberrations initially thought severe enough to warrant commitment, the Cowley Road Hospital at Oxford was able to take 125 such patients. Only four had to be committed to mental hospitals. Cosin believes that this method of therapy has cut the admissions to mental hospitals by 80 percent for patients over 65. Many of the mental aberrations are caused by simple circulatory deficiency, and most of the patients respond to good medical management in 20, 30, or 40 days.

—HARALD M. GRANING, M.D., regional medical director with the Public Health Service, Region 5, Chicago, addressing the 1956 Middle States Health Conference.

be in process. If well executed, they may contribute effectively to the public health dentist's project. Such surveys sometimes appear in unexpected places, in State agricultural colleges (21-23) for example. Records from industrial plants, dental schools, or clinics often can be collated and the findings used profitably. Also, the Public Health Service may have conducted surveys in your State.

An example of a survey which was conducted for one purpose but served another is Wishik's survey of handicapped children (24). It brought into focus the particular oral health problems of congenital clefts and malocclusion in addition to other handicapping problems.

Survey Four: Characteristics of the State

The following story illustrates the importance of a survey of the general characteristics of the State and its population:

A few years ago a million-dollar foundation was established to promote the health of the citizens of a certain State. To bring medical and dental care to rural people, several beautiful health centers were built in isolated areas, and the million dollars was soon spent. Today only one of these centers is open, and that one only part time. The population decreased from about 6,000 to less than 1,000 for each health center. There was scarcely anyone left to use the health centers and no one to man them.

A team of cultural anthropologists have stated, "Knowledge of the people is just as important in many aspects of a public health program as is knowledge of medical [dental] science" (25). They listed what should be surveyed from a cultural and socioeconomic standpoint: folkways, income and cost of living, social organization of families, level of education and literacy, political organization, and religious factors. To this list might be added percentage of people receiving public assistance, rural and urban characteristics, and sources of income.

As far as population per se is concerned, the following might be considered: the distribution of the population by geographic area, by age, and by ethnic group, and trends in population growth and movement. The fluoride content of water supplies and climatic factors that

might influence water consumption are other characteristics to be investigated (26).

Many of these characteristics can be surveyed simply by examining the latest Federal census report. Up-to-date population estimates often can be obtained from the State's vital statistics division and verified against estimates by public utilities. In New Mexico, the State university's bureau of business research has provided pertinent information. In some States, commissions or bureaus dealing with economic development can supply useful data.

A survey of the fluoride content of water supplies can be conducted in various ways. In New Mexico, water samples were collected by dentists, pharmacists, and science teachers who volunteered their services. Cooperation was excellent, and considerable interest in fluorides was aroused. Two chemistry teachers made class projects of their part in the survey.

Survey Five: Oral Diseases

Paraphrasing a well-established concept, Knutson gives the reason for a survey of the prevalence and incidence of oral diseases (7): "Effective application of measures for the control of disease depends to a great extent upon knowledge of the manner in which disease occurs in population groups."

Generally, those oral conditions which are most prevalent or which contribute significantly to mortality rates should be surveyed. Specifically, the following hazards, conditions, and diseases should be considered (6, 8, 27, 28):

1. *Dental caries*: The greatest portion of the workload for dentists is the direct or indirect result of dental caries (29).

2. *Periodontal diseases*: Periodontal diseases are a prominent cause of tooth loss in middle and later life (28), and more information on these diseases is needed (30, 31).

3. *Malocclusion*: The inclusion of orthodontic care in dental public health services and surveys of the extent of the problem of malocclusion have been recommended (32).

4. *Congenital oral defects*: The need for early detection of oral clefts has been delineated (24, 32, 33).

5. *Oral cancer*: The need for early detection of oral and related cancer is set forth by Patterson (34), Lloyd (35), and Russell (28).

4. Whenever possible, conduct a pretest or pilot survey.

5. Utilize every opportunity to gain pertinent information.

6. Write out what you plan to do, how you plan to do it, and what you are going to do with the data after they are obtained. In particular, write out definitions for terms; for example, what exactly is meant by DMF or malocclusion. In the process, hazy definitions can be clarified and methods described so that the survey can be repeated at a later date.

Survey One: Subjective Impressions

Despite the difficulty of recording and analyzing subjective impressions or opinions, an attempt to do so may provide valuable information. A social scientist has said that "it is not so much what the facts actually are, but what people believe to be the facts" (16). Knowledge of what people believe to be the facts should help in planning how results of other surveys can be used so that they will be accepted. Also, it may provide leads to what other surveys should be undertaken, and it may be used to some extent in program evaluation.

The opinions of at least three groups are important: the dentists of the State, who not only may be the sole sources of particular information but who also may hold the key to the solution of certain problems; the public, to whom the public health dentist owes first allegiance; and the public health dentist's co-workers.

A written questionnaire is one way of conducting this type of survey. It can be mailed to all the dentists in the State, for example, or handed out at meetings of community organizations. The questionnaire may be a checklist of common oral health problems, or it may contain open-end questions. Parten's book (13) is particularly helpful in designing and using questionnaires. It points out, for instance, that appealing for information as a personal favor has been more productive than offering a reward or stressing some advantage to the respondent.

Another method of learning people's opinions is the workshop (17). *Adult Leadership*, especially the May 1953 issue (18), offers many suggestions for planning such meetings.

Still another method, the least practical but the most accurate, is the personal interview survey in which a well-planned question schedule is used (19). Sometimes a graduate student at a State university will conduct such a survey as work toward an advanced degree.

Whatever the method selected, a social psychologist should help in planning the survey (19).

Survey Two: Knowledge, Attitudes, Practices

A survey of dental health knowledge, attitudes, or practices may be combined with survey one. All that was said about that survey applies to this type.

A recent survey conducted in New Mexico illustrates the why and how of a knowledge survey. Its purpose was to learn the status of dental health information so that a dental health education program could be concentrated on the areas needing attention. Also, the findings would serve as baseline data for measuring the effects of a dental health education program.

A trial questionnaire of 18 questions was developed. It sought to cover the major areas of dental health information, particularly those in which it was suspected that the public is poorly informed. On the basis of a pretest, four questions were eliminated and several were revised. The final form was checked by the department's psychologist for vocabulary level (fifth grade) and format and by the director of vital statistics for machine punchcard tabulations. The test, given to any group interested in it, has been taken by more than 4,000 persons.

Measurement of attitudes and practices is somewhat more difficult than measurement of knowledge, but it can be done. Metzner's article (20) provides excellent background information for this type of survey. Crude estimates of attitudes and practices may be derived from such items as the extent to which candy and sweetened beverages are sold in schools, the number of toothbrushes sold each year, the F component of the DMF rate, and the number of referral cards returned signed by a dentist.

Survey Three: Review of Surveys

Surveys pertinent to a particular facet of oral health may already have been conducted or may

sonnel: dental hygienists, dental assistants, and dental laboratory technicians.

Factors about dentists to be investigated include age, mortality, specialty, postgraduate training, and type of practice (full or part time; public, private, or industrial). Dentist-population ratios should be calculated by trade areas or, where this is not feasible, by city, county, and State. Many of these data can be obtained by a mail questionnaire. Other sources are census reports, the American Dental Directory, and records of State board examiners. Frequently, dental supply houses and dental laboratories can supply up-to-date information on the location of dentists and the type of practice in which they are engaged. In small States, the day-to-day contacts of the public health dentist may elicit such information. Also, many national surveys, particularly those conducted by the American Dental Association, have a sufficient sampling from the more populous States to be directly applicable to those States.

"A Study of Oklahoma's Dental Manpower Requirements" (47) is an excellent guide to surveying a State's dental manpower resources. In particular, it considers the age of dentists as a prime factor in productivity, a point often overlooked. In addition to dentists and dental hygienists, which the Oklahoma study surveyed, one may wish to include dental assistants and laboratory technicians.

Physical facilities to be surveyed include the various types of dental clinics, Federal, State, and local, voluntary and official, mobile and fixed, industrial, school, hospital, and institutional, as well as private offices.

Training facilities for dentists, hygienists, assistants, and technicians also should be taken into account. Finally, facilities such as those for examination of biopsy specimens, treatment of cancer, making of lactobacillus counts, and rehabilitation of oral clefts should be searched out and evaluated.

Survey Seven: Auxiliary Resources

Frequently, there are other resources than strictly dental that will contribute to the solution of dental health problems. Already mentioned are the State agricultural colleges,

which sometimes are engaged in research related to dental health. Colleges and universities may also provide such services as vocational counseling and postgraduate courses for dentists.

Other auxiliary resources are to be found within the official health agency itself. The environmental sanitation division, for example, can supply data on community water supplies and can help in the engineering aspects of fluoridation. The industrial hygienist can provide valuable leads to occupational hazards and to groups available for dental surveys.

The voluntary agencies, too, often can contribute materials or services. Foundations often have funds and personnel waiting for a worthy project. Why shouldn't that project be a dental one?

These resources are usually found by an informal survey; that is, by contacting the right people and asking the right questions.

Survey Eight: Blocks to Solutions

Blocks to the attainment of optimum oral health have been classified as follows: psychological, educational, professional, economic, social, and geographic (48). In public health, a seventh block might be added: administrative. The job of surveying these blocks will have been largely completed if the other surveys described have been made. For example, a survey of the State and its characteristics may reveal hindrances of distance, economics, or cultural patterns (49). Direct surveys of these blocks may, of course, be indicated. For best results, the aid of a social scientist should be enlisted.

Special Problems

It may well be necessary to undertake a special research study during the course of an investigation of a State's oral health status. Often, however, such a study can be dovetailed with other surveys. In New Mexico, for example, a special study (38) was necessitated by the State dental society and the health department's request for an immediate answer to the question, how much fluoride is optimum for New Mexico's climate? To determine preva-

6. *Other diseases and hazards:* Other diseases and hazards pertinent to a particular State may be included; for example, chronic endemic dental fluorosis (6, 26, 36-38), the sequellae of oral trauma (particularly fractured (39) and avulsed incisors), the dental stigmata of congenital syphilis (40, 41), and occupational hazards and diseases (28).

In planning how to conduct the survey, the standard types of survey inspections or examinations may be reviewed and the most pertinent type selected (42). Consideration should be given to the universal record form (43) or, at least, to the possibility of recording data so that they can be translated into terms of the universal form.

Next, whom and where to survey has to be decided. Of necessity, sampling must be considered. Sampling by age, geographic area, socioeconomic level, occupation, cultural pattern, rural and urban area, climate, fluoride content of water, and other characteristics is easier if such characteristics have been delineated for the State by survey four.

Practicality often precludes the use of the best sampling procedures. Since budget and time usually demand that a clinical survey be conducted where people congregate, the dental survey often takes place in a school or industrial establishment. Despite these handicaps, careful planning can still yield worthwhile results. For example, a consolidated school system makes possible the sampling of both rural and urban populations.

Variables that may influence the findings should be reviewed. For example, a physician in New Mexico was sincerely convinced that the contrast in the dental caries prevalence between a fluoride and a nonfluoride city was due to income. When per capita income was shown to be the same for the two cities (38), he capitulated and supported fluoridation for the non-fluoride city.

Planning the actual mechanics of the field survey is the next task. Practices in one State are described in Baker's article (44) and in another in the California manual (45). A general review is given in "A Dental Health Inventory for Maintown" (46). Items to be considered range from dental instruments to wastebaskets. Impression materials and a

clinical camera are among the items that might be included.

An advance trip to the area where the survey is to be conducted is almost essential. Usually, despite voluminous correspondence, an on-the-spot planning meeting with all people concerned is indicated. The public health dentist has the obligation of providing those people with a brief written outline of the purposes and other pertinent information. In surveys of school populations, educational approaches, materials, and aids should be suggested.

The various indexes of oral diseases should be appraised carefully, especially from the standpoint of objectivity, reliability, and reproducibility, before final selection. Too often surveys have been wasted because the examiner *used an index that had meaning only to him.*

Who should perform the clinical examination is debatable. Some public health dentists conclude that whenever possible local dentists should be asked to participate. Others decide that insofar as possible only one examiner should be used. Circumstances may dictate the answer. If the survey is elaborate and detailed, perhaps only one or two examiners should participate. Otherwise, the benefits accruing from the use of local dentists may outweigh the disadvantage of less comparability.

Data for certain oral diseases can be obtained by other methods than the clinical survey. Morbidity and mortality rates for oral cancer and congenital defects, for example, are available from most State offices of vital statistics, subject, of course, to errors of diagnosis and inadequate reporting. The State crippled children's service usually maintains a register of cleft lip and palate cases.

Survey Six: Dental Resources

When the oral health problems have been measured, logically the findings should be compared with the findings of a survey of the resources available for meeting those problems. Then the most effective methods for utilizing and supplementing the resources can be determined.

Dentists are the chief manpower resources, but not to be forgotten are the auxiliary per-

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lence of fluorosis, the first survey was conducted among junior high school students in communities which, according to previous routine chemical analyses of the water, differed as to fluoride level. This study was integrated with a survey of other dental diseases.

Analysis and Interpretation of Data

Since all the surveys outlined in this paper are interrelated, some of them even being carried on simultaneously, plans for statistical analyses of the data should be laid early in the project. Sometimes findings from one survey will contradict the findings of another, and the differences must be resolved. Conversely, the results of one survey may reinforce those of another. It is here that the help of an expert statistician is invaluable.

Planning for the interpretation of the results to the profession and the public also should begin early, and the health educator should participate. Phair has challenged public health dentists to get away from the traditional technical interpretation of data and to explain findings in simple, meaningful terms (15). Unless plans are made to report and utilize the findings in a profitable manner (16, 19, 50), the surveys might as well not be done.

Summary

If one is to plan, execute, and evaluate State dental health programs in a logical manner, comprehensive information concerning the State's dental health needs and its resources is indispensable.

What do the people consider to be the oral health problems? What do the members of the dental profession see as the problems?

What is needed in the way of health education? What do people know about dental health? What do they do about it?

What is the distribution of the population by geographic area, by age, and by ethnic group? What are the trends in population growth and movement? What about the fluoride content of the water supplies?

What is the prevalence of the major oral diseases?

How many dentists are there in official agen-

cies? in private practice? in industry? How many auxiliary personnel?

What is the status of physical facilities?

Are there blocks to the attainment of optimum oral health?

Some of these questions can be answered simply by a search and study of existing source materials. Others require more formal surveys, such as questionnaires, personal interviews, or even clinical examinations. Then the data obtained in answer to specific questions must be analyzed and integrated to provide a complete picture of the State's dental health status.

At first glance the job may appear to be too overwhelming to tackle, but the State dental public health director and his staff can, with the help of others, accomplish it, bit by bit. Actually, of course, surveying is a continuing process, for conditions next year will inevitably differ from conditions this year.

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Analysis of Diabetes Screening Costs in a County Health Department

By ANDREW C. FLECK, Jr., M.D., M.P.H., and RITA C. CHISHOLM, R.N., M.A.

THE DECLINE in communicable disease morbidity and mortality has directed community health efforts to the prevention of chronic diseases. One form of action is the community-supported diabetes screening clinic designed to screen a hyperglycemic group by testing blood or urine specimens. The clinic may include a detection as well as a screening service (1).

The followup of hyperglycemic groups defined by screening tests shows that from 0.5 to 1.0 percent of the population screened have previously undiagnosed diabetes. No data are available, however, for evaluating the sensitivity or specificity of these screening techniques (2).

The earlier detection of diabetes in these clinics may arrest the progression of diabetes into disability and premature death; it is therefore recognized to be valuable as a secondary prevention which should be included in every organized public health program.

Three hypotheses generally accepted as the basis for operating a diabetes detection service are: (a) that diabetes mellitus is frequently unrecognized and asymptomatic; (b) that earlier diagnosis and management of diabetes improves prognosis; and (c) that untreated diabetics are abnormally hyperglycemic after food intake. A fourth hypothesis which is not generally accepted is that the postprandial hyperglycemic population can be economically and efficiently

screened from the general population by a community-operated clinic service.

The Rensselaer County Health Department tested this fourth hypothesis by relating costs to results in its diabetes screening clinic started in September 1954 in Troy, N. Y.

The objective of the diabetes screening clinic is the discovery of a hyperglycemic population that can be referred to physicians for detection of previously unknown diabetes. To demonstrate that this objective is being attained efficiently and economically we offer three indexes of results: number of persons screened, number of hyperglycemic persons discovered, and number of previously unknown diabetics detected.

During the first 4 months of operation in Troy, when methods were still relatively inefficient, 525 persons were screened. Eighteen were found to have capillary blood sugar levels greater than 160 mg. Five of these were diagnosed as previously unknown diabetics.

In 1955, under routine conditions, 1,438 persons participated. Forty-three persons were screened as hyperglycemic, and 13 of this group were diagnosed as previously unknown cases of diabetes (table 1).

Screening Methods

The screening clinics are conducted on a nonappointment basis 4 times a week for 1 hour. The health center is centrally located in Troy, a city of 73,768 persons. Promotion during 1955 was limited to newspaper and word-of-mouth publicity.

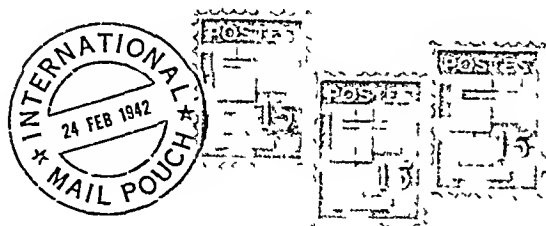
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Converts to Hospital Delivery

When the health center opened in the Arab village of Tira, public health nurses met with little success in inducing pregnant women to have their babies in the hospital. Women in the Little Triangle villages have always been delivered at home by *dayas*, women who practice midwifery under hazardous conditions.

When a woman went into labor recently, she called for help from the midwife licensed by the Tira Health Center. The midwife delivered the baby at home in the presence of the local *daya* because she was unable to persuade the mother to come to the center hospital.

A second woman went into labor shortly thereafter, and she too called for the licensed midwife. This time the midwife refused to deliver the child at home and succeeded in convincing the husband that his child should be born in the hospital. The center first had to agree that the *daya* would be present, the male physician would be absent, and the husband and others in the family could remain in the center for the birth.

Pleased with the care and treatment given to his wife and child, the father made an unprecedented

concession. He agreed that the mother and baby and all the family members could be photographed.

Word of the experience spread. Within the next 2 weeks, 12 women were delivered in the hospital. The task of the nurses in inducing women to have hospital deliveries has been easier ever since.

—JACOB H. LANDES, M.D., *acting chief, Health and Sanitation Division, United States Operations Mission, Israel.*

Sanitation School

The Palasht Sanitation School fulfills a basic sanitation need in the Middle East by providing practical training in the villages. Among the 170 sanitarians trained for the Ministry of Health, other government departments, and private agencies since the opening of the school in 1952 are 6 Afghans who are putting their education into practice in their own country.

Students attend classes in the morning, work outside in the afternoon. Half of their classtime is devoted to work in the laboratory. Among the subjects covered in the 7-month curriculum are bacteriology and parasitology, excreta disposal, refuse collection and disposal, milk and food sanitation, insect and rodent control, camp and swimming pool sanitation, vital statistics, and government organization in Iran.

—ALBERT P. KNIGHT, M.D., *formerly chief, Public Health Division, United States Operations Mission, Iran.*

reports were made voluntarily by the physicians. The other half were obtained by public health nurses. Diagnostic criteria used by physicians for establishing or excluding diabetes were quite variable. Among 27 suspects definitely diagnosed as diabetic or nondiabetic by family physicians, 13 diagnoses were made on the basis of 1 fasting blood sugar, 2 on the basis of negative urines, and 1 on the basis of a glucose tolerance test; 11 indicated that no glucose tolerance test was performed but did not indicate what criteria were used. The followup results taken at face value indicate the need for the inclusion of a detection service in the clinic with referrals for treatment on the basis of uniform diagnostic criteria.

Program Costs

The collection of cost data was a byproduct of a departmentwide performance budgeting system installed by the New York State Temporary Commission on Fiscal Affairs of State Government in 1954 (4). Two basic types of cost are identified, fixed and variable. Variable costs are incurred in direct proportion to patient participation. Fixed costs occur in setting up and being ready to start; they are costs which are not appreciably affected by patient volume. For example, the cost of the testing equipment is fixed and the cost of testing supplies is a variable cost. The sum of fixed and variable costs is the operating cost.

In calculating a cost per unit of result, it is important to have the distinctions between

Table 2. Expenditures for setting up the diabetes screening service, Rensselaer County Health Department, Troy, N. Y.¹

| Expenditure | Fixed cost | Variable cost |
|-------------------|------------|---------------|
| Technician fees | | \$156.25 |
| Intake clerk | | 40.00 |
| Finger lancets | | 40.00 |
| Reagent tablets | | 137.90 |
| Pipettes | \$424.56 | |
| Test tubes | 110.00 | |
| Testing apparatus | 1,000.00 | |
| Total | \$1,534.56 | \$374.15 |

¹ During September through December 1954, when 525 persons were screened.

Table 3. Monthly variable costs incurred in the operation of a routine diabetes screening service classified by object, Rensselaer County Health Department, 1955

| Month and item | Cost |
|---------------------------------------|------------|
| January-----{10-100 adhesive bandages | \$7.70 |
| Technician fees | 25.00 |
| Reagent tablets | 54.00 |
| February-----{1 case cotton balls | 15.30 |
| 1 case alcohol | 10.74 |
| Technician fees | 35.00 |
| March-----Technician fees | 35.00 |
| April-----Technician fees | 35.00 |
| Shipping clinitron | 9.01 |
| May-----Technician fees | 40.00 |
| June-----{10-100 adhesive bandages | 11.00 |
| Technician fees | 45.00 |
| Technician fees | 37.50 |
| July-----Finger lancets | 20.00 |
| 1 case facial tissues | 13.17 |
| Technician fees | 12.50 |
| August-----1 case gauze pads 3 by 3 | 38.00 |
| Technician fees | 17.00 |
| September-----Finger lancets | 20.00 |
| October-----Test reagents | 79.20 |
| Technician fees | 23.25 |
| Technician fees | 95.00 |
| November-----Test reagents | 183.00 |
| December-----Finger lancets | 40.00 |
| Jan.-Dec-----Intake clerk | 120.00 |
| Total variable cost | \$1,021.37 |
| Fixed costs ¹ | 206.91 |
| Operating cost for 1955 | \$1,228.28 |

¹ Equipment depreciation and replacement cost determined in 1954.

fixed, variable, and operating costs clearly in mind. For example, if a new program is planned on a 5- to 10-year operating basis, the operating cost is the most significant figure. On the other hand, if the program is being abandoned for economy reasons, the variable cost looms important since it is the only cost which will be saved.

Our operating cost was determined first by depreciating the equipment on a 10-year straight-line basis and the other fixed costs on a 5-year replacement basis. These figures were then added to the sum of all variable costs. The operating cost did not include the cost of services in the basic health department. These service costs could not be eliminated if the program were abandoned nor did they need augmenting when the program started. They included clinic space and public health nurse followup service.

The sum of \$1,908.71 was spent in the 4

Table 1. Diabetic screening results for 1955, Rensselaer County Health Department, Troy, N. Y.

| Age groups | General ¹ population | Patients screened | Positive tests ² | | Unknown diabetics detected | |
|---------------|---------------------------------|-------------------|-----------------------------|------------------------------|----------------------------|------------------------------|
| | | | Number | Percent of patients screened | Number | Percent of patients screened |
| 0-14----- | 19,425 | 23 | | | | |
| 15-24----- | 11,220 | 182 | 2 | 1.1 | 2 | 1.1 |
| 25-44----- | 19,681 | 606 | 9 | 1.5 | 1 | 0.2 |
| 45-64----- | 15,719 | 486 | 23 | 4.7 | 8 | 1.6 |
| 65 and over-- | 7,723 | 141 | 9 | 6.4 | 2 | 1.4 |
| Total---- | 73,768 | 1,438 | 43 | 3.0 | 13 | 0.9 |

¹ Estimated population distribution by age groups, Troy, July 1, 1955, office of vital statistics, New York State Department of Health.

² Capillary blood levels above 160 mg. percent blood sugar content.

A clerk-receptionist registers persons attending the clinic, and determines whether they came for a diabetes test or a chest X-ray. She completes a record card for the desired test and offers the additional screening procedure to the patient. A brief explanation of the procedure and objective of the screening tests is given by the receptionist to induce the patient to participate in both tests. The registration card contains, in addition to the usual identifying information, any family history of diabetes, height, weight, approximate weight 5 years before, time since eating last meal, and the source of referral. The patient is then directed to the X-ray room or the diabetes testing room.

For diabetes screening, the technician copies on the test tube the code number appearing on the registration card which the patient has brought with him. Testing procedure begins with the collection of 0.1125 cc. of capillary blood from the fingertip, which is mixed with 5 cc. of distilled water diluent. The sample is then tested with standardized reagent tablets at a screening level of 160 mg. percent of blood glucose according to the method of Wilkerson-Heftmann (3). No urine specimens are taken, and no retesting service provided. At the same session a 4- by 5-inch stereoscopic photofluoro-

graphic chest X-ray is taken if the patient has consented to the additional screening procedure. Test results are then recorded on the registration card. Since both tests are performed in a few minutes, the average length of stay in the clinic is from 10 to 15 minutes.

The patient is advised both verbally and by a brochure that reports of both procedures, accompanied by one-half of the 4- by 5-inch stereoscopic X-ray film, will be sent to the family physician. Patients with positive tests are referred to their physicians for diagnostic study. The physician is then requested to report his diabetes diagnostic findings to the clinic on an enclosed self-addressed coded postcard when the diabetes test is positive. If the diabetes test is positive or if there are abnormal X-ray findings, the individual is sent a letter advising him to consult his physician. In general, the agency follows up with nursing service all cases with positive screening tests until a diagnosis is established or excluded.

Problems in Operation

On intake in the clinic, 637 persons had not eaten within 2 hours. One hundred sixty-five persons attended 4 to 6 hours after eating regardless of the timing of the clinics. Only 812 had eaten within 2 hours. To meet this problem we are now exploring the specificity and sensitivity of screening at two different levels: 160 mg. if the specimen is postprandial or 130 mg. if it has been more than 2 hours since the last meal.

Acceptance of both screening procedures is greatly influenced by the attitude and interest of the registration clerk. When the same clerk served at each clinic the participation improved. We do not recommend the use of a public health nurse for registration because of the greater cost and the fact that the nurse's time is better spent in promotional and educational activity in the field.

The only bottleneck encountered during the tests was in developing enough skill to draw 0.1125 cc. of blood without undue "milking" of the finger. This problem was overcome after a few sessions. For rapid testing, a clinitron is used (4).

During 1955, only 50 percent of the followup

The 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., accurately identified an estimated 40 cases of primary lung cancer in about 802,000 residents examined.

Followup Study of 844 Neoplasm Suspects Identified in a Mass Chest X-ray Survey

By C. DEAN McCLURE, M.D.

STATISTICAL and clinical studies of the effectiveness of mass chest X-ray surveys in finding primary lung cancer have been reported since 1950 (1-6). Because of continued and rather widespread interest in this subject, the results of a similar study carried out as part of the followup of the 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., are recorded here. In this study, 844 persons classified on the basis of survey films as neoplasm suspects were followed for 30 months to determine their clinical diagnoses and mortality experience.

As stated by the Pittsburgh and Allegheny County X-ray Survey Foundation, the primary purpose of the survey was to screen the adult population (over 15 years of age) of Pittsburgh and Allegheny County for undiagnosed active

tuberculosis. An important secondary purpose was to screen the group for other active chest diseases, including neoplasms.

Survey Procedures

All persons participating in the survey initially had 70-mm. postero-anterior chest films. These were read for abnormalities by at least 1 member of a team of 4 Public Health Service physicians. Participants whose films were considered negative were so notified by mail. Resident participants whose films were technically unsatisfactory or showed abnormal findings were requested to report to survey headquarters for confirmatory films.

On return for a confirmatory film, the participant was interviewed by a clerk, and basic

Dr. McClure is a research fellow in epidemiology at the Graduate School of Public Health, University of Pittsburgh. He was assigned to the Pittsburgh area in 1953 by the National Cancer Institute, Public Health Service, to conduct epidemiological studies of lung cancer. At the direction of the Pittsburgh Department of Public Health, he conducted the long-term followup study of neoplasm suspects reported here.

Dr. C. Howard Marcy, secretary of the Pittsburgh and Allegheny County X-ray Survey Foundation, and Dr. Robert Anderson, at the time of the study, chief of the Tuberculosis Control Division, Public

Health Service, made available the original survey records. Dr. Merle Bundy, then director of tuberculosis control, Pittsburgh Department of Public Health, and secretary, Allegheny County Chapter, American Cancer Society, assisted in the study planning.

Dr. Mary E. Patno, office of biostatistics, Pittsburgh Department of Public Health, tabulated the general survey data. J. William Lloyd of the same office made the special tabulations of the neoplasm suspects. Miss Bernadette Brady of the Public Health Service assisted with the special followup of the neoplasm suspects.

Table 4. Relationship of diabetes screening costs to result, Rensselaer County Health Department, 1955

| Type of cost | Total expense | Cost per person screened (1,438) | Cost per suspect (43) | Cost per new case detected (13) |
|--|---------------|----------------------------------|-----------------------|---------------------------------|
| Fixed cost (depreciation and replacement) ¹ ----- | \$206. 91 | \$0. 14 | \$4. 80 | \$15. 90 |
| Variable costs----- | 1, 021. 37 | . 71 | 23. 75 | 78. 56 |
| Operating cost----- | \$1, 228. 28 | \$0. 85 | \$28. 00 | \$92. 50 |

¹ Gross fixed costs for 1954 were \$1,534.56.

months it took to establish the clinic on a routine basis. Table 2 shows how this cost was distributed as fixed or variable.

Relationship of Cost to Result

The operating cost for diabetes screening during the 4 months of operation in 1954 was \$581.06. Five previously undiagnosed diabetes were detected at an operating cost of \$116.21 each.

Only variable costs were incurred during 1955. They are listed in table 3 exactly as the obligations were incurred. This time sequence should give the reader an insight into the development of the operation.

In 1954 there were no expenditures for certain supplies, such as cotton and alcohol, which were drawn from existing stocks. Such items are included in the 1955 expenses and an inventory was left at the end of that year. No adjustment was made since the inventories were small and a cost adjustment would not significantly alter the analysis.

In using these data we find that the operating cost (including the annual fixed replacement and depreciation cost determined in 1954) for

diabetes screening in 1955 was \$1,228.28. How the various component costs contained within the operating cost relate to the results is shown in table 4. Most significant is the fact that the cost of detecting a case of diabetes is \$92.50 under present patient volume. This should approach the variable cost of \$78.56 per new case as better promotion of the program is attained. In the first 4 months of operation in 1954 a similar variable cost of \$74.00 was obtained.

Summary

Diabetes screening procedures for promotion of earlier detection are a recognized form of secondary prevention of disease. In a community-operated screening clinic, a post-prandial hyperglycemic population can be delineated from the general population by capillary blood sugar determination at a cost of approximately 85 cents per person screened. One year's experience has shown that the cost of detecting one previously unknown case of diabetes should approach a cost of \$75 per new case found.

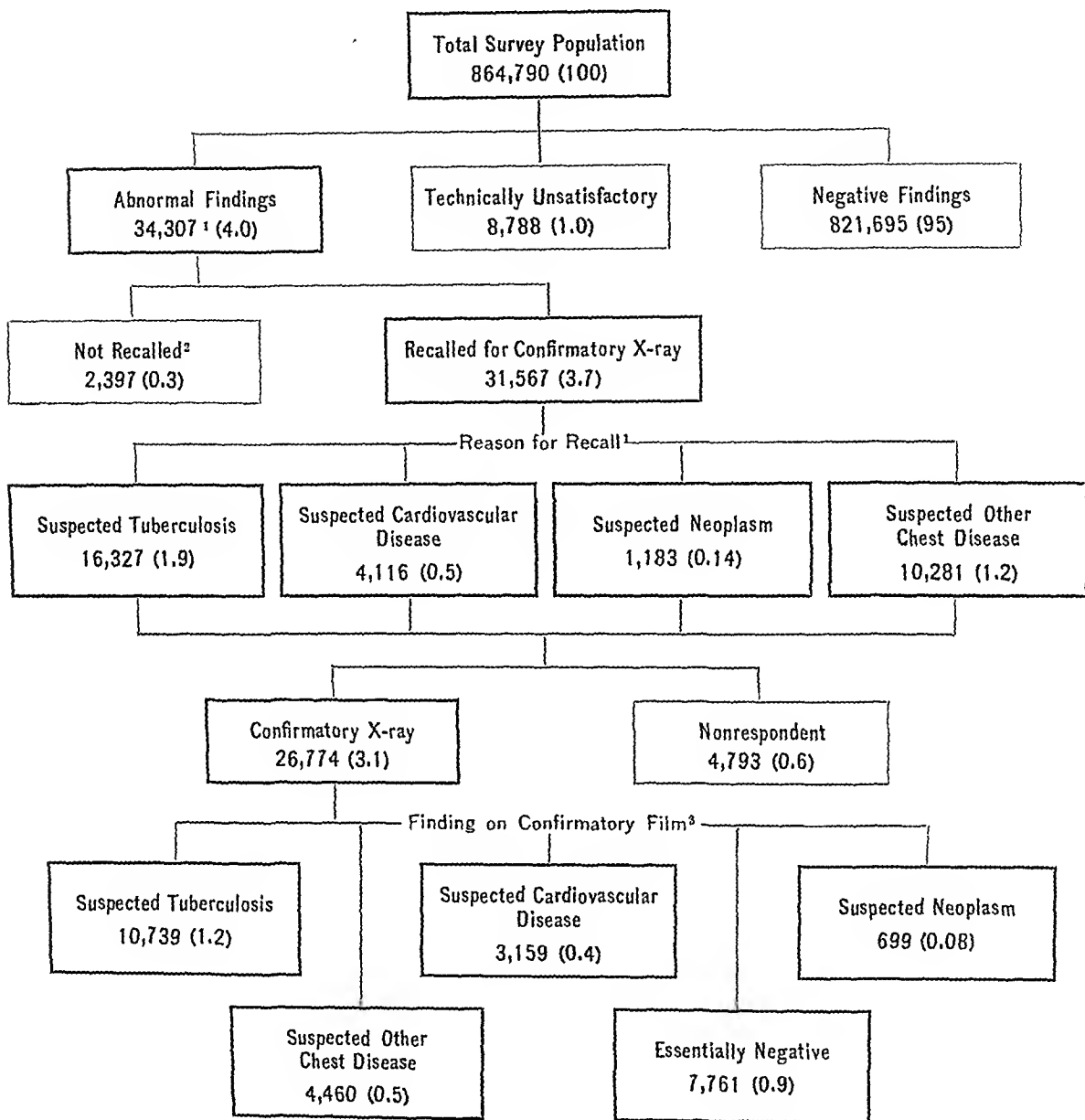
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**Results of the Mass Chest X-ray Survey in Pittsburgh and Allegheny County, Pa.,
March 25–September 25, 1953**



¹Based on interpretation of original 70-mm. films (including 343 duplicates, triplicates, etc.).

²Residence outside survey area.

³Based on interpretation of confirmatory 14" x 17" or 70-mm. films (including 44 large films taken on persons other than those recalled).

NOTE: Figures in parentheses are percentages based on total survey population.

data, including the name of the participant's private physician, were recorded on an epidemiology worksheet. All persons responding to recall who were suspected on the basis of the original 70-mm. film of having tuberculosis, neoplasms, or "other chest disease" routinely had 14" x 17" postero-anterior confirmatory films. Lateral or oblique views were filmed whenever the film interpreter requested them. All persons suspected of having cardiovascular disease had 70-mm. confirmatory films.

Four main categories of chest disease suspects were referred to their private physicians on the basis of the confirmatory film or, if the participant failed to respond to recall, on the basis of medical review of the original 70-mm. film. Nonrespondents were referred only when their 70-mm. films were regarded by the medical review committee as warranting further clinical study. For these cases, the basic epidemiological data were gathered through telephone calls or visits by nurses to the participants. Each referral was accompanied by the partially completed epidemiology worksheet. The physician was requested to add to this the final diagnosis of the patient's chest condition when it had been determined and to return the form to survey headquarters as soon as possible. If the private physician referred the patient to another physician for diagnosis, a duplicate epidemiology form was sent to the new physician with the same request.

The epidemiology forms provided most of the data upon which the clinical findings reported in the following section are based. However, additional followup procedures, including telephone calls and special letters to the physicians, were employed by the survey personnel and the local unit of the American Cancer Society to determine clinical diagnoses for the 784 neoplasm suspects who were referred. Of the 844 neoplasm suspects included in this study, 60 were not referred because they could not be located, had died, or were uncooperative.

General Survey Results

The total number of persons X-rayed in the survey was 864,790, which represents approximately 75 percent of the total population of Allegheny County eligible for participation. However, that figure includes many visitors to the county and a few persons who were X-rayed more than once. At present, the best estimate of the number of visitors and multiple films is approximately 62,759, which leaves a total of 802,031 residents X-rayed. This estimate is based on the percentage of visitors and multiple films noted in the recall population.

Because of the size of the task, the age-sex rates of participation have not yet been determined. Thompson and Pell, however, have estimated the age-sex participation rates for approximately 80,000 residents of the Arsenal

Table 1. Estimated resident participation in the 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., by age and sex

| Age group (years) | Males | | Females | | Total participants |
|-------------------|------------------------------------|----------------------------------|------------------------------------|----------------------------------|--------------------|
| | Percent participation ¹ | Number participants ² | Percent participation ¹ | Number participants ² | |
| 15-24----- | 48.6 | 50,585 | 57.5 | 67,212 | 117,797 |
| 25-34----- | 57.0 | 72,123 | 58.4 | 80,980 | 153,103 |
| 35-44----- | 66.9 | 77,293 | 61.0 | 73,880 | 151,173 |
| 45-54----- | 64.4 | 60,737 | 67.9 | 64,871 | 125,608 |
| 55-64----- | 57.2 | 43,727 | 56.8 | 41,456 | 85,183 |
| 65-74----- | 53.4 | 22,733 | 47.3 | 20,733 | 43,466 |
| 75 and over----- | 34.7 | 5,389 | 25.0 | 4,868 | 10,257 |
| Total----- | 58.6 | 332,587 | 58.6 | 354,000 | 686,587 |

¹ Weighted averages for combined age groups of Arsenal health district sample (7).

² Obtained by applying participation rates to population of Allegheny County in 1953, as estimated by applying age-sex percentage distribution in 1950 to estimated 1953 population.

Table 4. Mortality experience of 844 neoplasm suspects identified in the mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., according to clinical diagnosis after referral

| Clinical diagnosis | Number persons in category | Dead | | | | | | Alive end of 30 months | | Status unknown end of 30 months | |
|---|----------------------------|----------------------------------|------------------------------------|-----------------------------------|------------------------------------|----------------|---------|------------------------|---------|---------------------------------|---------|
| | | First report period ¹ | | Second report period ² | | 30-month total | | Number | Percent | Number | Percent |
| | | Number | Average annual mortality (percent) | Number | Average annual mortality (percent) | Number | Percent | | | | |
| Chest neoplasm..... | 335 | 58 | 17.3 | 18 | 5.4 | 76 | 22.7 | 203 | 60.6 | 56 | 16.7 |
| Primary malignancy: | | | | | | | | | | | |
| Lung..... | 46 | 28 | 60.9 | 3 | 11.1 | 31 | 67.4 | 12 | 26.1 | 3 | 6.5 |
| Mediastinum..... | 15 | 2 | 13.3 | 0 | 0 | 2 | 13.3 | 9 | 60.0 | 4 | 26.7 |
| Other site..... | 14 | 3 | 21.4 | 3 | 18.2 | 6 | 42.9 | 6 | 42.9 | 2 | 14.3 |
| Metastatic malignancy to thoracic organs..... | 27 | 11 | 40.7 | 2 | 8.3 | 13 | 48.1 | 10 | 37.0 | 4 | 14.8 |
| Benign neoplasm..... | 233 | 14 | 6.0 | 10 | 3.0 | 24 | 10.3 | 166 | 71.2 | 43 | 18.5 |
| Tuberculosis..... | 127 | 3 | 2.4 | 4 | 2.2 | 7 | 5.5 | 100 | 78.7 | 20 | 15.7 |
| Cardiovascular disease..... | 32 | 4 | 12.5 | 3 | 7.1 | 7 | 21.9 | 20 | 62.5 | 5 | 15.6 |
| Other chest disease..... | 155 | 7 | 4.5 | 7 | 3.2 | 14 | 9.0 | 112 | 72.3 | 29 | 18.7 |
| Negative..... | 70 | 2 | 2.9 | 1 | 1.0 | 3 | 4.3 | 51 | 72.9 | 16 | 22.9 |
| No report of clinical findings..... | 125 | 9 | 7.2 | 10 | 5.9 | 19 | 15.2 | 79 | 63.2 | 27 | 21.6 |
| Total..... | 844 | 83 | 9.8 | 43 | 3.8 | 126 | 14.9 | 565 | 66.9 | 153 | 18.1 |

¹ October 1953 through September 1954.

² October 1954 through March 1956.

confirmatory films. Of those recalled, 26,774 (84.8 percent of recall population) responded.

Of the total original 70-mm. films, 16,327 (1.9 percent) were interpreted by the reader as suspected tuberculosis. Similarly, 4,116 (0.5 percent) were classified as suspected cardiovascular disease; 1,183 (0.14 percent) as suspected neoplasm; and 10,281 (1.2 percent) as suspected other chest disease. On the basis of the confirmatory films, the yield of suspected tuberculosis was reduced to 10,739, or 1.2 percent of the total survey population. Likewise, the yield of suspected cardiovascular disease was reduced to 3,159 (0.4 percent); the yield of suspected neoplasm to 699 (0.08 percent); and the yield of suspected other chest disease to 4,460 (0.5 percent). Interestingly, 7,761 participants, 0.9 percent of the total survey population, originally had X-ray findings classified as abnormal but were considered "essentially negative" after their confirmatory X-rays.

Clinical Diagnoses Reported

A total of 19,130 persons were referred to their private physicians for diagnosis (table 2). These include, in addition to those who had ab-

normal findings on the confirmatory film, some persons who were referred on the basis of their original small X-rays. During the survey followup period, April 10, 1953-June 30, 1954, clinical diagnoses were reported to survey headquarters for 10,693, or 55.9 percent, of those referred. No report of clinical findings was received for the remaining 8,437 persons referred.

The most common diagnosis reported was tuberculosis (all stages, including inactive cases), which was returned for 4,928 persons (46.1 percent). A diagnosis of cardiovascular disease was reported for 1,679 persons (15.7 percent); a diagnosis of neoplasm for 270 (2.5 percent); and a diagnosis of "other chest disease" for 2,485 (23.2 percent). A clinical impression of essentially negative was reported for 1,331 persons. This figure represents 12.4 percent of those for whom clinical diagnoses were received and 7.0 percent of the 19,130 referrals.

Study of Neoplasm Suspects

For the 844 persons identified in the survey as neoplasm suspects, a Public Health Service research team undertook special followup pro-

health district in Pittsburgh (7). By applying these rates to the estimated age-sex distribution for the 1953 population of Allegheny County, the number of residents X-rayed in each age-sex group can be calculated, as shown in table 1. According to this method, the total number of resident participants was 686,587, considerably fewer than the number found by subtracting the estimated number of visitors and multiple films. However, Thompson and Pell have stated that they felt the participation

rates in the Arsenal health district were lower than those for many other sections of the city and county.

X-ray Findings

As shown in the accompanying diagram, 4 percent of the total survey population were considered to have abnormal X-ray findings on the basis of the original 70-mm. films. Of these, 31,567 (all those with abnormal findings who were residents of the county) were recalled for

Table 2. Clinical diagnoses reported during survey followup period (April 10, 1953-June 30, 1954), according to type of disease suspected at time of referral: 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa.

| Disease suspected at time of referral | Number persons referred | Clinical diagnosis reported after referral | | | | | | No report of clinical findings |
|---------------------------------------|-------------------------|--|------------------------|----------|---------------------|----------|--------|--------------------------------|
| | | Tuberculosis | Cardiovascular disease | Neoplasm | Other chest disease | Negative | Total | |
| Tuberculosis..... | 10,315 | 4,595 | 71 | 28 | 667 | 825 | 6,186 | 4,129 |
| Cardiovascular disease..... | 3,256 | 2 | 1,397 | 2 | 15 | 61 | 1,477 | 1,779 |
| Neoplasm..... | 784 | 107 | 25 | 180 | 245 | 56 | 613 | 171 |
| Other chest disease..... | 4,775 | 224 | 186 | 60 | 1,558 | 389 | 2,417 | 2,358 |
| Total..... | 19,130 | 4,928 | 1,679 | 270 | 2,485 | 1,331 | 10,693 | 8,437 |

Table 3. Clinical diagnoses¹ for 844 neoplasm suspects identified in the 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., according to site of tumor suspected at time of referral

| Suspected tumor site | Total persons in category | | Clinical diagnosis reported after referral | | | | | | | | | | | | | | | | No report of clinical findings ² | | | | | |
|----------------------|---------------------------|---------|--|---------|--------------|---------|------------|---------|---|------------------|-----------------------|---------------------------|---------------------------|---------------------|-----------|---------|--------|---------|---|------|----|------|-----|------|
| | | | Primary malignancy | | | | | | Meta-static malignancy to thoracic organs | Benign neo-plasm | Total chest neo-plasm | Tuber-culosis, pulmo-nary | Cardio-vascu-lar dis-ease | Other chest disease | Negat-ive | | | | | | | | | |
| | | | Lung | | Medi-astinum | | Other site | | | | | | | | | | | | | | | | | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | | | | | | |
| Lung----- | 525 | 100 | 40 | 7.6 | 1 | 0.2 | 10 | 1.9 | 24 | 4.6 | 50 | 9.5 | 125 | 23.8 | 121 | 23.0 | 14 | 2.7 | 125 | 23.8 | 57 | 10.9 | 83 | 15.8 |
| Mediastinum----- | 270 | 100 | 6 | 2.2 | 14 | 5.2 | 1 | .4 | 1 | .4 | 165 | 61.1 | 187 | 69.3 | 5 | 1.9 | 17 | 6.3 | 23 | 8.5 | 8 | 3.0 | 30 | 11.1 |
| Bone----- | 42 | 100 | 0 | 0 | 0 | 0 | 2 | 4.8 | 2 | 4.8 | 15 | 35.7 | 19 | 45.2 | 1 | 2.4 | 1 | 2.4 | 6 | 14.3 | 4 | 9.5 | 11 | 26.2 |
| Other----- | 7 | 100 | 0 | 0 | 0 | 0 | 1 | 14.3 | 0 | 0 | 3 | 42.9 | 4 | 57.1 | 0 | 0 | 0 | 0 | 1 | 14.3 | 1 | 14.3 | 1 | 14.3 |
| Total----- | 844 | 100 | 46 | 5.5 | 15 | 1.8 | 14 | 1.7 | 27 | 3.2 | 233 | 27.6 | 335 | 39.7 | 127 | 15.0 | 32 | 3.8 | 155 | 18.4 | 70 | 8.3 | 125 | 14.8 |

¹ Includes clinical findings obtained from hospital and office records and death certificates as well as those reported to survey headquarters.

² Includes 60 persons not referred to physicians for clinical diagnosis.

Table 6. Cause of death for 126 neoplasm suspects who died during the 30 months following the 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., according to site of tumor suspected at time of referral

| Suspected tumor site | Number persons in category | Cause of death | | | | | | | | | | | | Total | |
|----------------------|----------------------------|-------------------|------|----------------------|------------------------------|-------------------|------|----------------------|------------------------------|------------------------|------|----------------------|------------------------------|---------------|------------------------------|
| | | Lung cancer | | | | Other cancer | | | | Other or unknown cause | | | | Number deaths | 30-month mortality (percent) |
| | | 1953 ¹ | 1954 | 1955-56 ² | 30-month mortality (percent) | 1953 ¹ | 1954 | 1955-56 ² | 30-month mortality (percent) | 1953 ¹ | 1954 | 1955-56 ² | 30-month mortality (percent) | | |
| Lung..... | 525 | 17 | 13 | 9 | 7.4 | 11 | 6 | 6 | 4.4 | 6 | 7 | 11 | 4.6 | 86 | 16.4 |
| Mediastinum..... | 270 | 1 | 4 | 0 | 1.9 | 3 | 2 | 2 | 2.6 | 5 | 7 | 9 | 7.8 | 33 | 12.2 |
| Bone..... | 42 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 7.1 | 1 | 3 | 0 | 9.5 | 7 | 16.7 |
| Other..... | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total..... | 844 | 18 | 17 | 9 | 5.2 | 15 | 9 | 9 | 8.9 | 12 | 17 | 20 | 5.8 | 126 | 14.9 |

¹ Deaths during last 3 months of 1953.

² Deaths during 1955 and first 3 months of 1956.

the majority of these moved within Allegheny County during the 30-month period; however, none appeared on the county death lists for that period.

A total of 126 deaths are known to have occurred among the neoplasm suspects during the 30-month followup period. This number is considered the minimum 30-month mortality estimate for the group since it is unlikely that all deaths were identified in this followup study. Eighty-three of the deaths occurred by the end of September 1954, giving an average annual mortality of 9.8 percent. Among the 46 persons reported to have primary lung cancer, there were 28 deaths (60.9 percent) during that period. The mortality among the non-lung-cancer patients was only 6.9 percent. The average annual mortality for all categories decreased during the second report period. The 30-month mortality figures show the highest rate for lung cancer patients.

Of the 126 known deaths during the 30-month followup period, 44 were due to lung cancer (tables 5 and 6). Cancers of other sites were the causes of 33 additional deaths, while the remaining 49 deaths were ascribed to causes other than cancer or to unknown causes. Thus, the minimum 30-month mortality among the neoplasm suspects by cause of death was 5.2 percent for lung cancer, 3.9 percent for cancers of

other sites, and 5.8 percent for all other or unknown causes. Most of the lung cancer deaths (79.5 percent) occurred by the end of 1954. Non-lung-cancer deaths, however, were more evenly distributed over the 30-month followup period.

The 30-month lung cancer mortality rate was highest (63.0 percent) among those cases diagnosed as primary lung cancer (table 5). However, 10 of the 388 persons with clinical diagnoses of either benign neoplasm or "other chest disease" also died of lung cancer during this period. Similarly, most of the lung cancer deaths (88.4 percent) occurred among those who were suspected of having lung tumors at the time of referral (table 6). The 30-month lung cancer mortality for this group was 7.4 percent. The group suspected of having lung tumors had a 30-month mortality rate for all causes of death of 16.4 percent.

Discussion

The crude yields of abnormal films, of suspected tuberculosis, and of suspected neoplasm from the survey of Pittsburgh and Allegheny County are commensurate with confirmatory findings reported for other mass chest X-ray surveys (1-5). For all categories of disease, there were wide variations between the readings

cedures, including abstracting of hospital and office records, examination of death certificates, and search of county death lists. By these procedures, clinical diagnoses were obtained for an additional 106 of the neoplasm suspects, and new diagnoses were found for a number of the 613 suspects for whom clinical findings had been reported during the survey followup period.

Clinical Diagnoses

The most frequent diagnosis for the neoplasm suspects was some type of neoplasm, as shown in table 3. (This table includes the clinical findings obtained by the special followup procedures; therefore, the data differ from those in table 2.) Most of the neoplasms, however, were benign chest tumors. Only 75 (8.9 percent) of all the neoplasm suspects were reported to have primary malignancies of the chest, and only 46 (5.5 percent) had diagnoses of primary lung cancer. Other yields for the neoplasm

suspects included 127 (15.0 percent) cases of tuberculosis, 32 (3.8 percent) cases of cardiovascular disease, and 155 (18.4 percent) cases of "other chest disease." For 70 (8.3 percent) of the neoplasm suspects, the diagnosis was "essentially negative." No report of clinical findings was obtained for 125 (which includes the 60 who were not referred to physicians), or 14.8 percent of the suspects.

Mortality Experience

The survival status at the end of two report periods was determined for each category of clinical diagnosis (table 4). The first report period covers the first year following the end of the X-ray survey, that is, from October 1953 through September 1954. The second report period includes the 18 months from October 1954 through March 1956. Efforts to obtain survival data on the 153 persons classified as "status unknown" have been prolonged because

Table 5. Cause of death for 126 neoplasm suspects who died during the 30 months following the 1953 mass chest X-ray survey in Pittsburgh and Allegheny County, Pa., according to clinical diagnosis after referral

| Clinical diagnosis | Number persons in category | Cause of death | | | | | | | | | | | | Total | |
|---|----------------------------|-------------------|------|----------------------|------------------------------|-------------------|------|----------------------|------------------------------|------------------------|------|----------------------|------------------------------|---------------|------------------------------|
| | | Lung cancer | | | | Other cancer | | | | Other or unknown cause | | | | | |
| | | 1953 ¹ | 1954 | 1955-56 ² | 30-month mortality (percent) | 1953 ¹ | 1954 | 1955-56 ² | 30-month mortality (percent) | 1953 ¹ | 1954 | 1955-56 ² | 30-month mortality (percent) | Number deaths | 30-month mortality (percent) |
| | | | | | | | | | | | | | | | |
| Chest neoplasm..... | 335 | 17 | 14 | 6 | 11.0 | 12 | 4 | 6 | 6.6 | 4 | 8 | 5 | 5.1 | 76 | 22.7 |
| Primary malignancy: | | | | | | | | | | | | | | | |
| Lung..... | 46 | 17 | 10 | 2 | 63.0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 4.3 | 31 | 67.4 |
| Mediastinum..... | 15 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 6.7 | 0 | 1 | 0 | 6.7 | 2 | 13.3 |
| Other site..... | 14 | 0 | 1 | 1 | 14.3 | 1 | 1 | 2 | 28.6 | 0 | 0 | 0 | 0 | 6 | 42.9 |
| Metastatic malignancy to thoracic organs..... | 27 | 0 | 0 | 0 | 0 | 8 | 2 | 2 | 44.4 | 1 | 0 | 0 | 3.7 | 13 | 48.1 |
| Benign neoplasm..... | 233 | 0 | 3 | 3 | 2.6 | 2 | 1 | 2 | 2.1 | 3 | 6 | 4 | 5.6 | 24 | 10.3 |
| Tuberculosis..... | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 | 5.5 | 7 | 5.5 |
| Cardiovascular disease..... | 32 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3.1 | 2 | 1 | 3 | 18.8 | 7 | 21.9 |
| Other chest disease..... | 155 | 0 | 2 | 2 | 2.6 | 1 | 1 | 1 | 1.9 | 0 | 4 | 3 | 4.5 | 14 | 9.0 |
| Negative..... | 70 | 0 | 0 | 1 | 1.4 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2.9 | 3 | 4.3 |
| No report of clinical findings..... | 125 | 1 | 1 | 0 | 1.6 | 2 | 3 | 2 | 4.8 | 2 | 2 | 6 | 8.8 | 19 | 15.2 |
| Total..... | 844 | 18 | 17 | 9 | 5.2 | 15 | 9 | 9 | 3.9 | 12 | 17 | 20 | 5.8 | 126 | 14.9 |

¹ Deaths during last 3 months of 1953.

² Deaths during 1955 and first 3 months of 1956.

than those in the lung cancer diagnostic category. For all persons in these other diagnostic groups who died of lung cancer, the lesions present at the time of the survey X-ray appeared to be small. For some of them, the absence of specific symptoms delayed a definitive diagnostic workup until the lesion had become inoperable. In this survey, the difficulty of clinically distinguishing between neoplasms, tuberculosis, or other chest disease appeared to be most accentuated when the X-ray revealed small or rather poorly defined lesions in the lungs.

Each of the 8 surviving lung cancer patients who had pneumonectomies had an opacity measuring 3 cm. or more on the 14" x 17" survey X-ray. All other diagnostic aids employed, including cytological examination of sputum and bronchial washings, were negative for each of these patients. Only at thoracotomy was a definitive diagnosis established.

The 30-month mortality experience of the neoplasm suspects according to the site suspected at the time of referral further demonstrates the difficulty of finding salvageable lung cancer cases (table 6). The distribution of the 126 known deaths shows a high mortality from lung cancer among those persons originally suspected of having lung tumors. In fact, the group suspected of having lung tumors had rather high mortality from all causes of death. However, the deaths from cancer began to occur earlier than did the deaths from other causes.

The relatively high lung cancer mortality among the lung tumor suspects, together with the fact that 7 of the 8 patients who had pneumonectomies belonged to the lung tumor suspect group, indicates that the X-ray methods employed in the survey to find cases of primary lung cancer were of limited but definite effectiveness. Had there been greater survey participation by older men, it is very probable that the ratio of primary lung cancer cases to lung tumor suspects would have been greater.

Summary

A mass chest X-ray survey was undertaken in 1953 in Pittsburgh and Allegheny County, Pa., primarily to find undiagnosed active tuberculosis and secondarily to detect other chest diseases. According to the estimated age-sex

distribution of the survey participants, participation by older men was relatively poor. Thus, the effectiveness of the survey for detecting primary lung cancer was severely limited.

Of about 802,000 resident participants, 844 were classified as neoplasm suspects on the basis of 14" x 17" confirmatory films or 70-mm. original films. By the use of the usual followup procedures plus special measures, clinical diagnoses were obtained for 91.5 percent of the 784 neoplasm suspects referred to private physicians, and the mortality experience during a 30-month period was learned for 81.9 percent of the 844.

In both the group with clinical diagnoses of primary lung cancer and the group suspected on the basis of the X-rays of having lung tumors, the mortality rate was high and death occurred in a short time. These findings demonstrate the rapidly fatal course of lung cancer following detection by X-ray or clinical diagnosis. Eight of the fifteen survivors in the lung cancer diagnostic category had pneumonectomies. For each of these eight, the survey X-ray showed rather large lesions which ordinarily would not be considered "early," but apparently the malignant process was amenable to surgery.

Deaths due to primary lung cancer also occurred among persons with clinical diagnoses of benign neoplasm or "other chest disease." These deaths occurred somewhat later than the lung cancer deaths in the lung cancer diagnostic group. For most of these persons, the presumably misdiagnosed X-ray lesions appeared small or not well defined. The difficulty of distinguishing on an X-ray film between lung tumors, tuberculosis, and "other chest disease" is indicated by the fact that among the persons suspected of having lung tumors, the percentage with clinical diagnoses of chest neoplasm was no greater than the percentages with clinical diagnoses of tuberculosis or "other chest disease." However, the comparability of the clinical findings is difficult to evaluate because of the probably different diagnostic criteria used by the physicians examining the patients.

According to information available thus far, the mass X-ray survey accurately detected an estimated 40 cases of primary lung cancer

of the small and the large X-ray films. Such variations have been noted repeatedly by radiologists, and it has been assumed that the larger films can be interpreted more accurately for all types of chest disease. Thus, the reasons for taking large confirmatory X-rays in mass surveys are to reduce the number of false positives and to decrease the amount of unnecessary survey case followup. Whether or not large films are better than 70-mm. films from the standpoint of detecting neoplasms has apparently not been investigated, and the data presented here are not satisfactory for answering that question.

If the figures in table 1 represent even roughly the age-sex distribution of the survey participants, only 40 percent of the total X-rays of men were taken among those 45 years of age or older. Also, it is in the older age groups that the participation rate declines to less than 55 percent. Since a significant number of cases of primary lung cancer would be expected only among men over 45 years old, the effectiveness of the X-ray survey in finding cases of this disease was severely limited.

The clinical data presented are based largely upon the findings reported by physicians in response to the survey followup procedures. As such, these data are subject to many of the same biases recognized and reported for previous mass X-ray surveys. It is significant that by June 30, 1954, at least 10 months after all referrals were made, clinical diagnoses were reported for only 55.9 percent of the total number of persons referred. By this same date, clinical diagnoses were established for 78.2 percent of the neoplasm suspects. This higher percentage undoubtedly is due to the additional followup efforts made for this group. As a result of the special followup by a Public Health Service team, diagnoses were obtained for an additional 106 of the neoplasm suspects, bringing the percentage up to 91.5.

The yield of 5.5 percent for primary lung cancer among the neoplasm suspects is small in comparison with the yields for other diagnoses (table 3). This yield increases but slightly, to 7.6 percent, when only those persons suspected of having lung tumors are considered. The difficulty of accurately discriminating on X-ray between lung tumors, tuberculosis, and other lung diseases is reflected by the fact that among

the lung tumor suspects the percentage with clinical diagnoses of lung tumor was no greater than the percentage with clinical diagnoses of tuberculosis or "other chest disease." Accurate appraisal of any differences among these lung disease categories is obscured by the fact that different diagnostic criteria were undoubtedly applied by the many physicians reporting clinical findings. For several persons, the clinical diagnoses reported to survey headquarters had to be changed in the light of later findings noted by the physicians.

The mortality experience of the neoplasm suspects shows clearly the rapidly fatal course for the majority of the reported primary lung cancer cases (table 4). Twenty-eight of the forty-six persons with primary lung cancer died within 12 months after the end of the survey, and 31, within 30 months. Some question might be raised as to the accuracy of the diagnosis for the 15 survivors. For 8 of these, the diagnosis was confirmed microscopically, and the patients had pneumonectomies with apparently curative results. For the remaining 7 the diagnosis was based on X-rays alone.

The mortality rates were considerably higher for persons reported to have either primary or metastatic malignancies of the lungs than for those in the other diagnostic categories (table 4). Also, the majority of the deaths in the groups with malignancies occurred much earlier than the deaths in the other diagnostic groups. This observed early mortality suggests that many of the reported primary and metastatic lung cancer cases were brought to medical attention by the survey at a late stage of the disease. It is likely that extreme pathological changes were present at the time of the survey X-ray; consequently, the mortality rate was high. Deaths due to causes other than cancer occurred more frequently among persons in the non-lung-cancer diagnostic groups. This is probably due to the rapidly fatal course of both primary and metastatic lung cancers after diagnosis.

Deaths due to primary lung cancer occurred among persons in some of the other diagnostic categories; for example, the benign neoplasm and the "other chest disease" groups (table 5). These deaths, however, occurred somewhat later

A Year's Experience With a Nationwide TPI Testing Service

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SINCE THE ADVENT of the *Treponema pallidum* immobilization (TPI) test, laboratories throughout the world have been using this test procedure either experimentally as a research tool or as a diagnostic aid. However, numerous modifications of the original Nelson and Mayer method (1) have been adopted. A World Health Organization report (2) containing information from 25 laboratories performing the TPI test indicates little uniformity among the techniques employed.

Previous reports from the Venereal Disease Research Laboratory (3, 4) have shown that the reactivity level of the TPI test may be affected by alteration of the complement concentration in the test, by an increase in the amount of thioglycolate in the survival medium, or by failure to maintain an adequate and constant number of organisms in the treponeme suspension used as the test antigen. The technique employed at the laboratory during the period of this report used a concentration of complement four times greater than that recommended in the original Nelson and Mayer procedure, a fivefold increase in the concentration of thioglycolate, and a constant concentration of 15 organisms per high-dry (HD) field. As a result of the adoption of these and other selected modifications (5, 6) the TPI test has been in daily operation in the Venereal Disease Research Laboratory as a routine procedure for more than 18 months, with test runs including as many as 60 specimens per day.

In response to increasing requests for performance of the TPI test from physicians

throughout the United States and in the absence of adequate facilities for performing this procedure elsewhere, a TPI testing service was made available by the Venereal Disease Research Laboratory on a nationwide basis. Beginning January 1, 1955, State and Territorial departments of health laboratories and Public Health Service installations were included.

The purpose of this report is to evaluate a 1-year experience with this nationwide service, and to present the findings obtained by testing more than 2,400 serum specimens submitted through the State and Territorial departments of health laboratories.

During the period January 1 to December 31, 1955, a total of 2,875 serums were received from these sources. Of these, 2,487 were tested, 150 were bacterially contaminated and were unsatisfactory for testing, 15 had leaked or the tubes had been broken in transit, and 223 were not tested until after December 31, 1955, and therefore were not included in this report. The number of specimens submitted for testing increased sharply as the availability of the service was more widely publicized. During the first 6 months, 704 specimens were received. However, during the next 3 months more than 1½ times as many, or 1,140 serums, were received for testing. During the last 3 months of the year approximately the same number, namely, 1,031 specimens, were submitted for testing. The totals for the last 6 months of the year represented an actual testing load of 350 to 400 specimens per month.

Source of Specimens

Although serum specimens from other sources were tested during this period, only those from the laboratories of State departments of health are referred to in this report since each of these specimens was accompanied by a clinical data sheet listing pertinent facts of the patient's history. The data included evidence of history of treponematosis, such as previous diagnosis, therapy for syphilis, and evidence of syphilitic infection in the family; record of known serologic tests for syphilis; evidence of other diseases, especially those presumed to elicit nonspecific reactions in serologic tests for syphilis; and the physician's opinion

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among the participating residents of Pittsburgh and Allegheny County. Just how efficiently this was done cannot be answered from the data presented here, but certain deficiencies in the methods employed are evident.

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Syphilis Serology Courses

Nine laboratory refresher courses will be offered at the Venereal Disease Research Laboratory of the Public Health Service in Chamblee, Ga., September 1957 through May 1958, according to the following schedule:

Serology of syphilis: September 9-20, 1957; December 2-13, 1957; February 17-27, 1958; May 5-16, 1958.

Tests for syphilis using *Treponema pallidum*: October 7-18, 1957; March 10-21, 1958.

Control of syphilis serology by the regional laboratory: October 21-November 1, 1957; April 7-18, 1958.

The public health laboratory in venereal disease control: March 24-28, 1958.

The four courses in serology of syphilis consist of lecture, demonstration, and participation periods covering the most widely used procedures outlined in the 1955 edition of the *Manual of Serologic Tests for Syphilis*.

The two courses in *Treponema pallidum* tests for syphilis include instruction in the performance of the *T. pallidum* immobilization and complement fixation tests and other procedures.

Two courses in control of syphilis serology by the regional laboratory are designed for assistant laboratory directors and senior laboratory staff members. They include review of serologic evaluation programs, laboratory visits and field "workshop" procedures, and discussion of new methods using treponemal antigens.

The course on the public health laboratory in venereal disease control, designed for laboratory directors, includes discussion and demonstration of new procedures and use of laboratory aids in diagnosing venereal diseases.

Applications for the courses must be approved by the State health officer or laboratory director, by the medical officer in charge if the applicant is a Federal employee, or by the sponsoring organization of applicants from other countries. Reservations should be made not later than 1 month before the starting date of the course. Application forms may be obtained by writing to: Director, Venereal Disease Research Laboratory, Venereal Disease Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

Table 2. Summary of 2,652 serums submitted to the Venereal Disease Research Laboratory by State and Territorial health departments, January–December 1955

| Test results | Male | | Female | | Total | |
|---|--------|---------|--------|---------|--------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| Valid..... | 900 | 33.9 | 1,565 | 59.0 | 2,465 | 92.9 |
| Inconclusive..... | 8 | 0.3 | 14 | 0.5 | 22 | 0.8 |
| Not tested: | | | | | | |
| Bacterially contaminated, unsatisfactory for testing..... | 45 | 1.7 | 105 | 4.0 | 150 | 5.7 |
| Leaked or broke in transit..... | 5 | .2 | 10 | .4 | 15 | .6 |
| Total..... | 958 | 36.1 | 1,694 | 63.9 | 2,652 | 100.0 |

Table 3. Diagnosis and history versus TPI test result on 2,449 serums submitted to the Venereal Disease Research Laboratory, January 1–December 31, 1955

| Current diagnosis | Number | Percent | History | TPI test result | |
|---------------------------------------|--------|---------|-------------------|-----------------------------|--------------|
| | | | | Reactive or weakly reactive | Non-reactive |
| Syphilis..... | 295 | 12 | {Syphilis..... | 103 | 28 |
| | | | {No syphilis..... | 100 | 64 |
| Biologic false-positive reaction..... | 1,772 | 72 | {Syphilis..... | 97 | 40 |
| | | | {No syphilis..... | 621 | 1,014 |
| No opinion stated..... | 382 | 16 | {Syphilis..... | 66 | 36 |
| | | | {No syphilis..... | 131 | 149 |
| Total..... | 2,449 | 100 | ----- | 1,118 | 1,331 |

should be noted, however, that the patients in this study represented diagnostic problem cases, and the relationship observed between TPI test result and sex of the patient is not necessarily representative of random population groups.

Complete data relating diagnoses and patient histories to the TPI test results were available for 2,449 serum specimens (table 3). Of these patients, 1,772, or approximately 72 percent, were considered by the physicians submitting the serum specimens to be biologic false-positive (BFP) reactors in other tests for syphilis. In this group 137 patients had histories of a previous diagnosis of syphilis, but serum from 40 of these patients was nonreactive in the TPI test.

Of the 1,772 serum specimens giving biologic false-positive reactions, 718, or 40.5 percent, produced reactive or weakly reactive results in the TPI test. The positive findings obtained with other serologic tests for syphilis

in the absence of clinical evidence of syphilitic infection must be referred to either as latent syphilis or as false-positive test results. As determined from data furnished in the clinical data sheets accompanying the specimen of serum, 38 percent of those meeting these criteria gave reactive results in the TPI test. If it is presumed that a reactive result in the TPI test can only be caused by one of the treponemal infections, past or present, then the TPI test would be 100 percent specific by definition, and in this study the physician's current diagnosis of a biologic false-positive reaction would have been in error 38 percent of the time. On the other hand, as shown in table 3, regardless of the physician's opinion of present status of the patient, 72 percent of the serum specimens from 370 patients with histories of past syphilitic infections gave reactive results in the TPI test. The remaining 28 percent produced nonreactive results and were in disagreement with a previ-

about the present condition of the patient in terms of probable syphilitic infection. The bases for medical opinions were probably not constant since the 2,875 specimens were submitted by several hundred physicians through more than 50 State and Territorial laboratories.

Criteria for Acceptance

Criteria for acceptance in the TPI testing service required that the specimen be obtained from either diagnostic problem patients with no history or clinical evidence of syphilis or patients with suggestive evidence of syphilitic infection who had not received treatment; that neither the blood nor serum be exposed to rubber stoppers; and that a sterile serum sample be prepared by the State or Territorial health department laboratory and submitted with a completed clinical data sheet in the same mailing container to the Venereal Disease Research Laboratory. Specimens received directly from physicians were returned without testing. Reports of TPI test results were returned only to the submitting laboratory for subsequent forwarding to the originating source. The Venereal Disease Research Laboratory has furnished guide forms explaining these requirements, together with clinical data sheets, to the State public health laboratories for distribution to physicians.

Valid results were obtained with the TPI test on 2,465 serum specimens (table 1). The terms "reactive," "weakly reactive," and "nonreactive" are used instead of "positive," "weakly positive," or "doubtful," and "negative," in accordance with the 1953 recommendations of the National Serology Advisory Council to the Surgeon General of the Public Health Service.

Table 2 summarizes the findings for all of the 2,652 specimens which were included in this study.

All patients whose serum produced an inconclusive result in this test were treated with penicillinase and the serums were retested. The low percentage of inconclusive reports (less than 1 percent) was attributed to the use of paraffin-coated cork-stoppered tubes (7) instead of the rubber-stoppered tubes used in previous studies (8). Only 0.6 percent of the specimens were lost through leakage or breakage in transit. However 150 specimens, or almost 6 percent of the total, were grossly bacterially contaminated upon arrival and so were not tested. They were reported as "unsatisfactory for testing, due to bacterial contamination." Since adequate evidence regarding the possible effect of bacterial contamination of the serum on the TPI test result was not available, it was considered to be inadvisable to test grossly contaminated specimens.

As shown in table 1, approximately two-thirds of the specimens were from female patients. Since a request for a TPI test probably indicates some doubt as to syphilitic infection, these figures indicate that diagnostic problems occurred more frequently in females.

For the serum specimens which produced valid TPI test results, the percentage of positive findings (reactive plus weakly reactive) was lower for female donors (41.7 percent) than for male donors (52.4 percent). If TPI test negativity is taken as an index of false-positive reactions in other tests for syphilis, then these findings indicate a higher percentage of biologic false-positive reactors among female patients than was encountered among the male patients in this selected group. It

Table 1. Results of TPI tests on 2,465 serums submitted to the Venereal Disease Research Laboratory by State and Territorial health department laboratories, January 1–December 31, 1955

| Test result | Male | | Female | | Total | |
|----------------------|--------|---------|--------|---------|--------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| Reactive..... | 453 | 50.3 | 633 | 40.5 | 1,086 | 44.1 |
| Weakly reactive..... | 19 | 2.1 | 19 | 1.2 | 38 | 1.5 |
| Nonreactive..... | 428 | 47.6 | 913 | 58.3 | 1,341 | 54.4 |
| Total..... | 900 | 100.0 | 1,565 | 100.0 | 2,465 | 100.0 |

Vending Machine Sanitation

The changing character of the vending machine industry has given rise to new needs for sanitation. These needs, as well as current research and control efforts, were treated in panel discussions at the Regional Educational Conference of the National Association of Sanitarians in Atlantic City on November 11, 1956. The following are highlights from the panel presentations of Arthur J. Nolan, Dr. Walter L. Mallmann, and William C. Miller, Jr.

Sanitary Control Criteria

brief Coin machine sales of products and services, exclusive of music and games, amounted to approximately \$2 billion in 1956. More than 45 classes of products were sold, from aspirin to tissues, and including numerous items of food and drink. Typical service vending machines are coin changers, washing machines, toilet locks, and mechanical ponies.

The kinds and numbers of coin machines, particularly those dispensing food, have increased sharply each year.

To illustrate the scope of the industry, here are some statistics from the January 1956 *Vend*

By Arthur J. Nolan, M. S., vice president, research and development, Dixie Cup Co., Easton, Pa., and chairman of the National Automatic Merchandising Association Sanitation Committee.

Magazine census covering product vending machines on location:

| | <i>Units</i> |
|---------------------------------------|--------------|
| Confection and package goods..... | 1,500,000 |
| Cigarettes and cigars..... | 600,000 |
| Bottle drinks..... | 650,000 |
| Cup drinks, cold..... | 75,000 |
| Cup drinks, hot..... | 75,000 |
| Ice cream and frozen confections..... | 30,000 |
| Packaged and bulk milk..... | 30,000 |
| Miscellaneous other products..... | 200,000 |
| Total | 3,160,000 |

The rapid expansion of the vending machine industry after World War II brought to the fore a number of questions in the area of sanitation and public health.

There had been no recognition of the food and drink vending machines as such. Health jurisdictions were somewhat at a loss about how to interpret existing ordinances. Too often these had been set up for restaurants or food establishments, and chain stores, and the

ous diagnosis of syphilis made some time in the patient's past. Of those 295 specimens accompanied by a current diagnosis of syphilis, 92, or 31 percent, failed to react in the TPI test. The percentage of disagreement between a diagnosis of syphilis and the TPI test result was approximately the same, regardless of when the diagnosis was made.

In the biologic false-positive diagnosis category, 60 percent agreement with the TPI test was obtained. Overall correlation between the physician's present clinical opinion and the TPI test was approximately 61 percent.

Summary

1. Modifications of the original Nelson and Mayer method for performance of the *Treponema pallidum* immobilization (TPI) test adopted by the Venereal Disease Research Laboratory have made it possible to perform this test as a daily operating, routine laboratory procedure.

2. During a 1-year period of a nationwide TPI testing service offered to State and Territorial public health laboratories, more than 2,800 serums from diagnostic problem cases in syphilis were submitted for testing.

3. TPI test findings were considered in relation to the sex of patients, evidence of syphilitic infection, past or present, and the clinical opinions of the physicians submitting specimens for testing.

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Senior Research Fellowships

Applications for senior research fellowships may be filed with the Public Health Service until September 1, 1957. Awards will be made about December 1, 1957.

This program is designed to attract and to hold able investigators in the basic sciences in the preclinical departments of medical schools, dental schools, and schools of public health. These fellowships are awarded for 5 years and are renewable.

No stipend ceiling is established by the Public Health Service for the senior research fellowship. The university is to request the amount it considers most appropriate.

Address requests for information and application blanks to the Chief, Research Fellowships Branch, Division of Research Grants, National Institutes of Health, Public Health Service, Bethesda 14, Md.

tion of fresh products to residuals is not condoned because bacteria in the residuals may contaminate the fresh product, with possibly hazardous consequences.

Where readily perishable products, such as milk and cream, are dispensed, delivery tubes, valves, containers, and any other surfaces in contact with the ingredients or the finished product should be cleaned and sanitized at a central commissary. Research finds that microorganisms grow rapidly in such equipment unless it is cleaned and sanitized each time it is serviced.

The storage of soups and stews at a temperature of 150° F., or above, is a novel method of dispensing food. We have little information on long-time storage of foods at high temperature even in the area of "commercially sterile" canned products. Tests on canned products indicate little, if any, deterioration in quality after a reasonable period of storage.

Each new development in automatic dispensing of food brings new needs for research. Research to date indicates that the developments in coin-vended food are largely sound and that the food vended is sanitary.

Ordinance and Code

brief

Initially, food products sold in coin-operated vending machines were nonperishable or semiperishable, but the range of such foods has broadened in recent years to include many foods and beverages of a readily perishable nature. This transition introduced new problems of food protection not normally encountered in conventional food service operations.

As the vending of perishable food expanded, many States and communities requested the Public Health Service to develop criteria for sanitary control of machine-vended foods. The National Automatic Merchandising Association also asked the Service to develop a

Poisoning From Vending Machine Drinks

The Los Angeles Health Department reported that two persons experienced nausea and vomiting within 15 minutes after drinking from a bulk vending machine. Investigators found that a defective carbonator valve permitted carbon dioxide to back up into a copper waterline. Chemical analysis of water from the carbonator indicated 260 p.p.m. of copper.

model sanitation ordinance and code for vending machines as a guide for interested State and local health jurisdictions and for industry. They felt that uniform sanitation standards, similar to those developed by the Public Health Service for the sanitation of restaurants and market milk, were essential.

In 1954 the Service initiated field studies of current vending machine design, fabrication, and operation. Problems encountered were discussed in detail with State and local food sanitation authorities and representatives of the vending industry. Conferences were also held with groups and individuals connected with research in vending machine operations.

One of the first steps was a review of State and local regulations specifically directed to the sanitary control of vending machine operations. In 1954 only six local health departments reported adoption of such regulations, but many recognized the need for sanitary control of food vending. The most comprehensive standards reviewed at that time were those developed for the Armed Forces by the Subcommittee on Food Supply, Committee on Sanitary Engineering and Environment, National Research Council. Although designed for bulk-type machines vending carbonated beverages into single-service containers, the general criteria proposed in these suggested standards appeared applicable to many other vending machine operations. Industry also felt that these criteria could be applied practically.

Upon the conclusion of background preparation, the actual drafting of a proposed ordinance and code began in 1955. After a working draft was completed and discussed with industry, the second working draft was submitted in April

By William C. Miller, Jr., chief, Food Sanitation Section, Milk and Food Program, Division of Sanitary Engineering Services, Public Health Service.

special problems connected with unattended automatic vending machines were not contemplated.

At the National Sanitation Foundation meeting in 1947, a vending machine clinic initiated a program for research and standards in sanitation. The clinic was attended by manufacturers, suppliers, sanitarians, and by representatives of other public health groups. The program has continued from 1948 to the present. Research problems are referred to Dr. Walter L. Mallmann at Michigan State College.

The Public Health Service is drafting a model code and ordinance for food and drink vending machines. Concurrently, the National Automatic Merchandising Association committee is completing negotiations at several universities with public health schools and adequate laboratory facilities to test and inspect various types of vending machines against the standards proposed in the model code and ordinance. Additional standards, as needed, will be developed by a joint committee of industry and public health.

This committee of industry, military, and public health representatives, including Public Health Service officials, is being formed to evaluate the testing and continuing research programs. Representatives have been appointed by industry and by such organizations as the International Association of Milk and Food Sanitarians, the National Association of Sanitarians, and the American Public Health Association. They will meet shortly to examine the proposed program and protocol.

Microbiological Research

brief What differences in health and spoilage aspects are presented by coin-vended food and beverages that are not exhibited in manually dispensed products? Offhand, I think of two. Vended products are unique in that there are no

By Walter L. Mallmann, Ph.D., professor of bacteriology, department of microbiology and public health, Michigan State University of Agriculture and Applied Sciences, East Lansing.

personnel to supervise delivery of the product to the consumer. And then, the location of the coin machine may be in surroundings that definitely are objectionable for open-food dispensing.

The objective of research on vended food and beverages is to determine the minimum conditions under which they can be dispensed without adversely affecting health. Despite extensive research in food sanitation, the plan of robot vending introduces numerous problems of machine design and operation. The mechanical device has no power to differentiate between satisfactory and unsatisfactory products. The machine must be designed to prevent contamination by the environment or by the user and to maintain the food properly between servicings.

Although some research has been done on the various types of machines and products, much more information is needed on protection against health hazards, effect of contact surfaces on the product and the consumer, storage life of the product, temperature of storage, and kinds of spoilage encountered in vended products. So far, tests have been made on dispensers of carbonated beverages, fruit juice, milk, dry and liquid coffee, dry and liquid soup, sandwiches and salads stored at 50° F. or less and canned and commissary-prepared foods stored at 150° F.

My own work on carbonated beverages indicates that the sirups are relatively resistant to microbial decomposition because pH is low, sugar content is high, and sodium benzoate has been added. Storage of sirups under carbon dioxide atmospheres or at temperatures of 50° F. or less prevents mold. To lessen the introduction of microbial contaminants, all storage tanks, sirup lines, mixing valves, and other contact surfaces should be readily removable, easily disassembled, and easily cleaned. Obviously, the machine should be designed for protection against insects, rodents, and dust.

This holds for the general sanitary design of all coin-operated machines handling food products regardless of the degree of perishability.

Frequent cleaning and sanitizing is recommended for machines dispensing fruit juices, liquid soup concentrates, chocolate sirup, and other readily perishable products. The addi-

Public Health in a Nursing School

By ROBERT E. COKER, Jr., M.D., M.P.H., FRANCES E. HART, R.N., M.P.H.,
and DORIS GOSNELL, R.N., M.Litt.

MANY PEOPLE, both those concerned with public health nursing and those concerned with nursing education, have long felt that the curriculums of most 3-year schools of nursing leave a great deal to be desired concerning the community aspects of health and disease. In many schools of nursing the curriculum includes little or nothing concerning either the family aspects of illness or community health agencies other than the hospital and its staff.

In Butler County, Pa., the faculty of a 3-year school of nursing and the staff of the county health department are working together to integrate public health into the curriculum of the nursing school.

Background

The Butler County Memorial Hospital, established in 1896, was expanded in 1954 from approximately 200 beds to 300 beds. It is the only general hospital resource in Butler County, which has a population of approximately 103,000. The school of nursing was established in 1903.

The Butler County Health Department was established January 1, 1954, as the first county health department in Pennsylvania. In 1952,

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in anticipation of the establishment of the county health department, the Pennsylvania Department of Health had assigned public health personnel to Butler County. These personnel functioned as a State-administered local health district until the establishment of the county health department. The personnel of the State unit included a medical director, public health nurses, sanitarians, and clerical workers. After the formation of the county health department, the public health nursing staff was increased, additional sanitarians were employed, and a public health engineer and a public health educator were added to the staff.

During the 2 years from 1952 to 1954, while the public health program in the county was State-administered, the public health nursing staff and the faculty of the hospital's school of nursing began to work closely together. The faculty of the nursing school invited the director of public health nursing and staff nurses to participate in the instructional program of the school. The invitation was eagerly accepted. As the two groups worked together, each group became convinced that the curriculum of the school could be greatly enriched and the experience of the students could be greatly broadened by incorporating into the curriculum a community approach to health and disease.

In 1954, after a series of conferences between health department personnel and the nursing school faculty, it was concluded that experiences in community health for the nursing students could be incorporated into the curriculum. The administration of the hospital authorized the educational director and the medical-surgical instructor of the nursing school to

1956 for review and comment by all States, a representative number of communities, Federal agencies, the vending machine industry, and interested groups and individuals. Comments received are now under careful study for incorporation into the prepublication draft.

The format of the working draft resembles that in other recommended milk and food ordinances and codes developed by the Public Health Service: The ordinance provisions are followed by code material which details conditions of satisfactory compliance.

Sanitation provisions for vending machine operations are in section V of the proposed ordinance. This section is divided into seven parts. Part I deals with the source, wholesomeness, and protection of the food, beverage, and ingredients; refrigeration and warm storage of food; cleaning and bactericidal treatment of food contact surfaces; and protection of single-service containers. Part II relates to machine

location, and part III, exterior construction and machine maintenance. Part IV establishes construction and design criteria for both food contact and nonfood contact surfaces. Parts V and VI deal with water supply and waste disposal, and part VII contains provisions concerning the delivery of foods, ingredients, equipment, and supplies to the machine location.

The other sections relate to administrative procedures, disease control, and enforcement considerations.

Since the vending of readily perishable foods and beverages are the major public health problem, most of the ordinance provisions are concerned with the protection of these products. However, the ordinance itself covers all types of food and beverage vending machines.

Following a review of the prepublication draft of the ordinance with representatives of both official agencies and industry, the document will be published.

Emergency Health Service Training

Training in numerous phases of emergency health services is available to professional medical and health personnel on a nationwide scale.

The training covers public health activities in national emergencies, epidemiology, advanced training for sanitary engineers, public health nursing, operation of emergency water supply equipment, radiological monitoring, detection and control of radioactive pollutants in water, organization of communicable disease control programs, and active duty under actual emergency conditions.

Confined principally to officers in the Public Health Service's Commissioned Reserve, the training is made available either by attendance on active duty or through correspondence courses. Commissioned Reserve officers are professional medical and health workers who serve on active duty primarily in times of

national emergency and during training periods.

Courses are held regularly in Public Health Service facilities in Atlanta, Cincinnati, San Francisco, and Washington, D. C. Other courses are given by the Federal Civil Defense Administration in Battle Creek, Mich., by the Industrial College of the Armed Forces in Washington, D. C., or in association with local health agencies.

The Commissioned Reserve is open to physicians, nurses, dentists, sanitary engineers, pharmacists, veterinarians, psychologists, bacteriologists, microbiologists, medical record librarians, statisticians, health educators, medical and psychiatric social service workers, and other professional personnel actively engaged in preventive medicine and public health practice.

on home visits. In some instances, these visits were made to patients who had been discharged from the hospital, and the student observed how the public health nurse conducted health teaching in the home. In other instances, an attempt was made to provide observation home visits to types of cases which the student was not likely to see in the hospital.

Following these home visits, the student nurse reported her experiences to the class. The public health nurse helped the student with the preparation of these case studies, and a member of the staff of the health department attended the class presentations and case discussions.

This concluded the experiences of the first year in the integration of public health into the nursing school curriculum.

Results of First Year

At the end of the first year a meeting was held with the hospital administration, the advisory board of the school of nursing, the faculty of the school, and the personnel of the health department to evaluate the year's experience. This evaluation emphasized the following points:

- The reaction of the head nurses and supervisors who had spent a 2 weeks' orientation period in the health department was universally enthusiastic. Their consensus was that they had had a rich learning experience. Not only did they feel that the instructional program for student nurses had been enhanced but that they themselves were able to provide a higher quality of nursing service than formerly. They had developed a greater awareness of the hospital patient as a member of a family and of a community and of the community resources available to meet individual and family health needs.

- The faculty of the school felt that the interest, response, and motivation of the student nurses was very gratifying. The students, too, had developed a concept of the relationship of health and disease in individuals to family and community problems, a concept which previous classes had not developed. Their interest in the patients with whom they worked had been increased by seeing them in the frame of reference of the family and the community.

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- The number of referrals of hospital patients to the public health nursing service had been greatly increased. This was particularly apparent in the areas of maternal and child health and adult health or chronic disease, fields in which the health department was anxious to expand its activities. Referrals to each of these public health nursing services more than doubled. The quality of referrals also greatly improved in the sense that cases selected for referral were increasingly those for which public health nursing might be expected to provide help. This was partly the result of the desire of the hospital staff to provide additional teaching materials for the student nurses in the form of more patients for them to visit with public health nurses. But it was also felt that the increase in the number and quality of referrals resulted in large measure from the increased sensitiveness of the head nurses and supervisors to patient needs and to the potentialities of public health nursing.

- The reaction of the medical staff of the hospital to the program was excellent. In many instances, they had become aware of and made use of community resources which they had not before appreciated or used. This was reflected in part by an increase of more than 20 percent in referrals by physicians to the public health nursing service.

Extension to Third-Year Curriculum

With the gratifying results of this experience during the nursing students' first year, a plan was developed to incorporate the community aspects of nursing into the remainder of the curriculum. Since the students spend most of their time away from the local hospital in other affiliated institutions during their second year, attention was directed to the third year of the nursing course.

During this year, the first approach to the integration of public health into the nursing school curriculum was made through the students' experience in obstetrical nursing. The existing system of referrals of obstetrical patients to the public health nursing service from the practicing obstetricians and from the hospital obstetrical service made this integration easier. Here again, the first step was to

work with the medical director and director of nursing of the county health department to plan and organize such a revision of the curriculum.

First-Year Curriculum

The purpose of the curriculum revision was defined as "to enrich the student nurses' program of study by the integration of principles of public health and the social aspects of nursing into the total plan of instruction." Under this purpose, health department personnel planned with the faculty of the school of nursing to accomplish the following objectives:

- To provide experience for students in the team approach to problem solving.
- To demonstrate to students social and health problems of families in the home.
- To review course outlines and to provide instructors with teaching materials, references, and public health information in all areas where these could be adapted to the course.
- To set up in the course on sociology special health centered projects for students.
- To demonstrate home nursing visits to students using discharged patients with whom the student had worked in the hospital.
- To assist students in preparing case studies and in participating in class and ward discussions.
- To demonstrate the importance of continuity of patient care, social and emotional factors in relation to health and disease, and the role of the nurse in understanding the patient as an individual in relation to his family and the community.

After these objectives had been set, it was agreed that they could not be met unless the teaching personnel of the school, the hospital supervisors, and the head nurses themselves understood the objectives and had participated in the experiences which the students would be undergoing. Therefore, with the approval of the hospital administration, administrative supervisors, head nurses, and nursing school faculty who had not had previous public health experiences were each assigned to the health department full time for 2 weeks. This experience acquainted them with the health department, with community health problems,

and with the organizations, agencies, and community resources working with these problems.

While this program of experience for the instructional personnel was in process, detailed planning of the curriculum for the students was carried on. It was agreed that students should be introduced to the health department during their first week in school and even before their orientation to the various divisions of hospital nursing. This introduction was provided by a class visit to the health department, during which the work of the department and its relationship to community health programs were discussed by the medical director, director of public health nurses, director of environmental health, and public health educator.

The health educator then introduced the students to group discussion methods. A series of discussions was held, with the class divided into small groups. These discussions had the dual purpose of further developing the students' concept of community health and of providing an opportunity for them to develop skills in group discussion methods, skills which would be useful to them later in ward conferences and case discussions following visits to families in their homes.

During the course entitled "Introduction to the Medical Sciences," arrangements were made for each student nurse to spend a half day with a public health nurse visiting families in their homes. Observation experience in environmental health was also provided by having students spend another half day in field work with health department sanitarians. The course instructor prepared the way for these visits by advance discussion with the class and by providing a written guide for the student nurses to use in making observations. It was hoped that these visits would give the student some conception of what illness means to the family and the community as well as to the patient.

The next step in the program was to integrate public health into the course in "Medical-Surgical Nursing." The course instructor presented disease entities as community problems, and students studied some of the ways in which illness affects the community and ways in which community problems affect illness. Here again, in carefully selected cases, the student nurse accompanied the public health nurse

The general principles of neutron activation analysis and the availability of this service suggest that the method may be of value to public health workers.

Neutron Activation Analysis

By MORGAN S. SEAL, M.S., WILLIAM A. MILLS, M.S., and
JAMES G. TERRILL, Jr., C.E., M.B.

PUBLIC HEALTH laboratories may in the near future put to use a nucleonic method of identifying and measuring trace quantities of elements. In essence, the process consists of exposing a sample of the material to be analyzed to neutrons in a reactor. The elements in the sample thereby become radioactive and their radiations provide the key to their character and abundance. In most instances, this service may be obtained through contract with reactor operators.

The detection and quantitative estimation of trace quantities of metallic contaminants in such materials as water, milk, food, insecticides, and construction materials have always presented problems to the public health analyst. The magnitude of these problems depends on the specificity and sensitivity of standard analytical procedures available for each individual contaminant and, to a certain extent, on the medium in which the contaminant is found.

Recent developments in electrometric, spectrophotometric, and spectrographic techniques

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G. W. Leddicotte, chief of the activation analysis group at the Oak Ridge National Laboratory, and his staff assisted the authors in making a study of the neutron activation method of analysis. They contributed their time, facilities, materials, and knowledge.

have greatly increased the number of methods available to the chemical analyst and, in addition, because of the greater specificity of the new techniques, have shortened the time and reduced the labor required for most of the classic gravimetric and volumetric analytical procedures. Continued application of instrumental methods of analysis by public health workers should be encouraged through the development of applied research programs designed to solve specific public health problems. At the same time, public health personnel may want to consider the possibilities of using neutron activation analysis.

The theory of chemical analysis by the identification of characteristic radiations emitted by a particular nuclear species was advanced soon after the discovery of artificial radioactivity, and the technique was first applied to the solution of analytical problems in 1936 (1). Before the development of the nuclear reactor, however, these analyses necessitated the use of particle accelerators or other sources of highly energetic, charged nuclear particles. The scope of such analyses was necessarily limited by the low particle beam intensities.

In theory, any nuclear reaction producing a radioactive isotope that may be identified by its characteristic radiation can be used for activation analysis. However, the most useful reaction involves the capture of a neutron by a stable nucleus to produce a radioisotope of the original atom. The radioisotope formed will have a characteristic nuclear emission of a par-

provide the obstetrics instructor with an opportunity for field observation and experience with the health department. This experience included accompanying the public health nurse on home visits to patients receiving prenatal and postpartum care.

The experience of the student nurses also included visits to prenatal patients whom they would later see in the hospital on the obstetrical service, and visits in the home to mothers and babies whom they had cared for in the hospital. These visits were followed by case studies and class discussions, with health department staff participating. In preparation for the observation home visits with the public health nurse, the instructor provided the students with a written guide such as had been provided the first year students.

The students also participated in teaching classes of prospective parents, which are held on a continuing basis by the health department in cooperation with the nursing and medical staff of the hospital.

This is the extent to which the integration of public health into the curriculum of the Butler County Memorial Hospital School of Nursing has proceeded. It is the hope of both health department staff and nursing school faculty that this integration can proceed much further and that the participation of the health department in the instructional program of the nursing school can be expanded. An outpatient department will be developed in the hospital within the near future, and it is planned to take advantage of the opportunity which expanded clinical services will provide for instruction in community health.

Both the hospital and the health department feel that their effectiveness as community health agencies has been greatly improved. The hospital is producing graduate nurses who have a better concept of community health needs and resources. At the same time, patient care has

in many instances been improved by continuity of care between home and hospital. The health department has been able to expand services in certain areas of community need and its service to individual families has been improved by the close relationship to the hospital nursing staff. This is, however, a demanding program on health department staff. It is time-consuming and at times disruptive of service program organization. Nevertheless, it is felt that the ultimate contribution to community health is well worth the time and effort.

Summary

An experience in the integration of public health into the curriculum of a 3-year school of nursing has been described. Through the cooperative efforts of the Butler County [Pa.] Health Department and the faculty of the Butler County Memorial Hospital School of Nursing, with the sanction and support of the hospital administration, a plan was developed and carried out for providing student nurses with experiences in the community aspects of health and disease. This began with providing 2 weeks of full-time experience in the health department for hospital supervisors and head nurses. The nursing students' experiences included introduction to community health agencies, observation field visits with public health nurses and other health department staff, demonstrations in the continuity of medical and nursing care both before and after the patient's hospital stay, and case studies and discussions. These experiences were accompanied by a review of the curriculum and the planning of individual courses in such a way as to emphasize the interrelationships between individual patients, the family, and the community. Although this is a time-consuming program for the health department staff, it is believed that it pays substantial dividends in improved nursing service for the community.

or the ratio of the amount of activity produced in time t to that produced in infinite time. The half-life ($T_{1/2}$) is determined experimentally for each isotope. It may be obtained or calculated from any compilation of nuclear data, such as the Seaborg tables (3).

The actual irradiation is carried out in a nuclear reactor at a point where the desired neutron intensity (flux) is available. The neutron flux need not be constant, since both the unknown and the standard are subjected to the same flux during the same length of time. The sample is allowed to remain in the reactor until the desired amount of radioactivity is obtained, as calculated from the above equation. After this length of time, the container is removed from the reactor, and the samples are prepared for radiochemical separation, due precaution being observed to protect the worker from radiation exposure.

No specific instructions can be given for the preparation of the sample for radiochemical analysis, except to state that the sample must be put into solution. Procedures vary with such substances as plant material, animal tissue, and other matter. Care must be taken to prevent the loss of easily volatilized radioelements if they are being determined. Dissolution of the standard should present no problem since the standard selected will be readily soluble.

The validity of a radiochemical analysis depends on the fact that radioactive atoms behave exactly the same way chemically as nonradioactive atoms of the same element. Although a large amount of radiation may appear in a particular sample, the actual weight of radioactive material present is extremely minute, often being in the order of 10^{-10} gm., or even less. For this reason, it is usually necessary to add to the dissolved unknown measured quantities of pure, standardized, nonradioactive solutions of the element being determined. Such materials are known as carriers, since the relatively few radioactive atoms are carried with the milligram quantities of nonradioactive material throughout the radiochemical analysis. Recovery of the total amount of carrier in the final weighing form need not be quantitative, but it should be in the order of 60 percent or better.

The procedure for chemical analysis depends on the element being determined. Kahn has

prepared abstracts of unclassified radiochemical methods that cover the literature through 1953 (4). In addition, members of the Analytical Chemistry Division of the Oak Ridge National Laboratory are preparing an unclassified "master manual" of radiochemical techniques.

An Example: Copper Determination

To obtain more information on activation analysis, the authors, with the assistance of G. W. Leddicotte and the activation analysis group at the Oak Ridge National Laboratory, carried out three separate analyses: the determination of copper in a nickel oxide sample, the determination of copper in an animal tissue sample, and the determination of sodium in a cast iron sample. We selected these analyses because they present examples of a contaminant in both organic and inorganic materials and because they illustrate the differences between elements. Details of the experiment are given only for the determination of copper in nickel oxide.

Irradiation and Chemical Analysis

Triplicate 100-mg. samples of nickel oxide and a single 20-mg. sample of pure copper metal were irradiated for 16 hours in the Oak Ridge National Laboratory's graphite reactor. Neutron flux at the point of irradiation equaled about 6.50×10^{14} neutrons per cm.² per second.

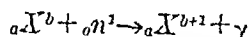
To separate the copper from the other elements, we followed the procedure set down by the laboratory's Analytical Chemistry Division, as given below:

1. To the acid solution of the irradiated sample, add standardized copper carrier and the following holdback carriers: iron, cobalt, zinc, manganese, cadmium, strontium, and sodium.

2. Adjust the solution to 1N HCl, saturate with sodium sulfide, centrifuge, and discard supernate. Wash precipitate with two 10-ml. portions of hot water. Centrifuge and discard washes.

3. Dissolve the precipitate in 1 ml. of concentrated HNO₃ containing BrO₃, dilute to 10 ml. with H₂O, and add Fe holdback carrier. Make basic with 6N NH₄OH, and centrifuge out Fe(OH)₃. Add additional Fe holdback carrier, and centrifuge down on top of first Fe(OH)₃ precipitate. Discard precipitate.

ticular energy or energies. In the most frequently used type of reaction, the nuclear emission is a gamma (γ) ray, and reactions of this type are commonly designated as (n,γ) reactions. A generalized reaction of the (n,γ) type is:



In this reaction, the elemental isotope (X) is bombarded by a neutron (n), resulting in a radioactive isotope of the element (X) and an instantaneous gamma ray (γ). Decay of the radioactive isotope may result in a characteristic gamma ray. It is the characteristic gamma ray of the radioactive isotope that is of importance in this method, not the gamma from the (n,γ) reaction.

Modern radiation-detection instruments are capable of detecting gamma radiation of a particular energy and of differentiating it from gamma radiations of other energies. The amount of gamma activity is dependent on the quantity of radioactive nuclei present. In addition, each radioisotope decays at a constant rate. By observing the amount of gamma activity at two or more suitable time intervals, the decay rate may be ascertained. These quantities, the energy and the decay rate, are normally sufficient to determine exactly what nuclear species are present; the activity then determines the number of radioactive atoms present.

Neutron activation analysis has been carried out on an ever-increasing scale at the Oak Ridge National Laboratory since 1943. Since it is not the purpose of this paper to review the theory or the history of neutron activation analysis, the reader is referred for this information to the excellent unclassified report entitled "Neutron Activation Analysis" by Leddicotte and Reynolds (2).

General Procedure

The sample containing the contaminant may be either a solid or a solution. In either case, a known amount by weight or by volume is placed in a suitable container for insertion in a nuclear reactor. A pure weighed sample (analytical reagent grade will usually suffice) of the element to be determined, known as the standard,

is also placed in the container, as close to the unknown as possible. The container is usually made either of quartz or aluminum, substances which do not shield the samples from the neutron field and which do not in themselves present an excessive radiation hazard after neutron bombardment. For the sake of accuracy, two or more samples of both the unknown and the standard are prepared.

The standard may be either the element itself, as is the case with copper determinations, or a stable compound, such as Na_2CO_3 for sodium determinations. The use of a thermally stable chemical form of the standard is important, since the samples are often subjected to considerable heat. More important, however, it is desirable for safety reasons that the elements in the standard other than the element being determined not form intensely radioactive isotopes.

The size of the samples and standards depends on the rate of formation of the radioisotope in a particular neutron field. The rate of formation may be calculated from the rate of decay, which, as stated above, is a constant for a particular radioisotope. In addition, the known intensity of the neutron field and the probability that a particular atom will capture a neutron enter into the calculation. The probability that a certain reaction between a nucleus and an incident particle or photon will occur is known as the nuclear cross section of the atom. These factors may be summarized in the following equation:

$$W = \frac{AM}{6.02 \times 10^{23} f \sigma S}$$

where

W = weight of the element

A = activity of disintegrations per second

M = chemical atomic weight

6.02×10^{23} = Avogadro's number

f = neutron intensity (flux) per cm^2 per second

σ = probability of neutron capture (cross section) in cm^2

S = saturation factor

The factor S warrants further explanation.

$$S = 1 - e^{-\frac{0.693t}{T_{1/2}}}$$

tion of the positive electron (positron) and the emission of the rare-occurring (0.5 percent) 1.34-Mev. gamma from the Cu^{64} isotope. When a positron emitter decays, the positron and an electron will collide, annihilate their masses, and produce, usually, two gammas of 0.51 Mev. each. (The energy associated with the rest mass of an electron or positron is 0.51 Mev.) The scintillation spectrometer was calibrated with a known source of Na^{22} , which is also a positron emitter, in addition to having a transition gamma. Figures 1, 2, and 3 show the results from the spectrometer. Since a gamma peak for all samples occurred at 0.51 Mev., the purity of the copper in the test samples was satisfactory.

Limitations

Like any other method of analysis, radioactivation analysis has its limitations. These limitations may be divided into three classes: physical, chemical, and nuclear (5).

Physical

1. A sample must be of such character as to withstand temperatures of possibly 70° C. to 90° C.

Figure 2. Cu^{64} spectrum: standard sample.

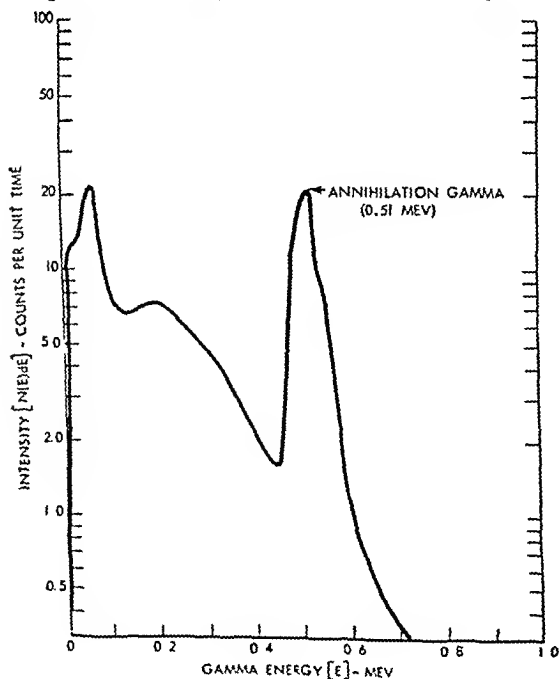
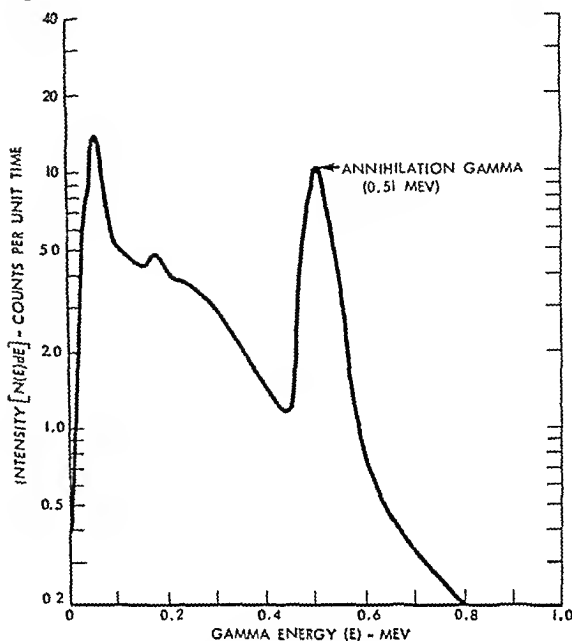


Figure 3. Cu^{64} spectrum: nickel oxide sample.



2. Containers must be constructed of materials that, when irradiated, have very short half-lives.

3. The size of the samples is limited by the irradiation space in a reactor.

Chemical

1. Samples may undergo structural changes as a result of high radiation intensities, and these changes may result in losses of radioactive material by volatilization.

2. Some limitations arise in separating the desired activity from other radioactive elements in the samples, the magnitude of these limitations depending on the number of steps in the radiochemical procedure used.

3. It is not always easy to treat the samples in such manner that the irradiated element and the carrier element will behave similarly chemically.

Nuclear

1. The samples must not have such a high neutron absorption as to affect the neutron flux throughout the samples.

2. A major limitation is that the isotope formed may be the result of neutron reactions other than an (n, γ) reaction.

3. Of some importance is the formation of radioisotopes of the same element differing from

Table 1. Results of copper determination

| Sample | Net weight (mg.) | Dilution | Separated CuCNS weight (mg.) | Percent yield ¹ | CCM ² (counts per minute) |
|-------------------|------------------|-------------------|------------------------------|----------------------------|--------------------------------------|
| Nickel-oxide..... | 52.4 | 1:1 | 19.1 | 40.3 | 41,032 |
| Nickel-oxide..... | 43.7 | 1:1 | 22.2 | 46.8 | 37,233 |
| Nickel-oxide..... | 46.2 | 1:1 | 27.1 | 57.2 | 43,443 |
| Standard..... | 41.0 | 1:10 ⁴ | 27.2 | 57.4 | 99,763 |
| Standard..... | 41.0 | 1:10 ⁴ | 21.9 | 46.2 | 79,581 |

¹ Theoretical yield of CuCNS was 47.4 mg.

² Count corrected for background and chemical yield.

4. Acidify with HCl to 0.5N in HCl. Add sodium bisulfite solution to reduce Cu^{++} to Cu^+ , and add solid KCNS until CuCNS precipitates; then add slight excess of KCNS. Centrifuge and wash precipitate with two 10-ml. portions of water.

5. Filter with suction through a tared filter paper. Wash with three 5-ml. portions of water and three 5-ml. portions of alcohol. Dry 15 minutes at 110° C. Weigh as CuCNS (1.92 mg. per mg. Cu). Mount and count.

Calculating the Quantity

After chemical separation, each sample was counted on a scintillation counter, using a thallium-activated sodium iodide crystal, an RCA 5819 photomultiplier, and an aluminium absorber for stopping soft beta rays. (Other equally suitable counting methods are available.) From the radioactivity in the standard

samples and that in the nickel oxide samples, the trace quantity of copper was determined. The data for the samples are given in table 1.

Calculations for the determination of copper were based on the following relationships:

$$\text{Percent chemical yield} = \frac{\text{weight of CuCNS recovered}}{\text{theoretical yield of CuCNS}} \times 100.$$

$$\text{Count corrected for background (CCB)} = \text{CCM} - \text{background per minute.}$$

$$\text{Count corrected for chemical yield (CCY)} = \frac{\text{CCB}}{\text{percent chemical yield}}$$

$$\text{CCY for unit weight of Cu in standard} = \frac{\text{CCY} \times \text{dilution}}{\text{weight of standard sample}}$$

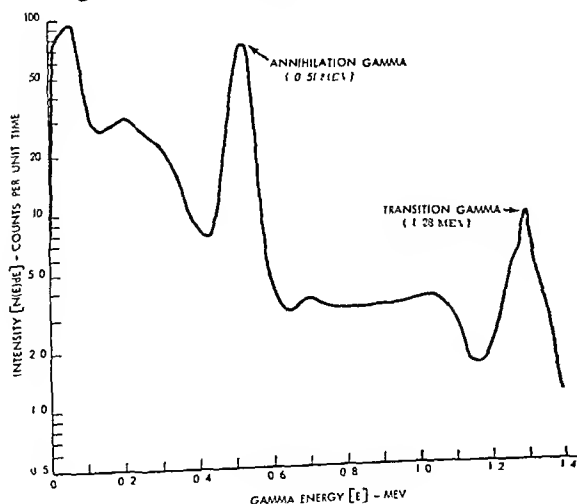
$$\begin{aligned} &\text{Calculation of Cu in unknown sample:} \\ &\frac{\text{CCY for Cu in } X \text{ sample}}{(\text{weight of } X \text{ sample}) (\text{CCY for unit weight of Cu in standard})} \\ &= \text{number of grams of Cu in } X \text{ sample.} \end{aligned}$$

Results of the calculations gave an average value of 4.21×10^{-5} gm. Cu per gram of nickel oxide.

The purity of radioactive copper in the samples was checked in two ways.

First, we checked the radioactive half-life by re-counting each sample after an appropriate time interval. The decay agreed within 3 percent of the 12.8-hour half-life of the Cu^{64} isotope.

Second, we examined one of the standard samples and one of the unknown samples on a single-channel gamma ray scintillation spectrometer to measure the energies of the gamma rays emitted from Cu^{64} . The gamma rays measured were those resulting from annihila-

Figure 1. Calibration spectrum of Na^{22} 

Preliminary studies indicate that the RPCF test is comparable in sensitivity with the TPCF test. It compares favorably in specificity with the TPCF and TPI tests. The production of antigen for this test is relatively simple and inexpensive.

Reiter Protein Complement Fixation Test for Syphilis

By GEORGE R. CANNEFAX, B.S., and WARFIELD GARSON, M.D., M.P.H.

SUSPENSIONS of the Reiter strain of *Treponema pallidum* were first employed in the serodiagnosis of syphilis by Gaehtgens (1). He reported satisfactory sensitivity and specificity with a complement fixation test in which the suspension was used as antigen. Reports of the use of Gaehtgens' antigen in this country first confirmed (2-4) and then denied (5, 6) the specificity of the test. Subsequent investigations demonstrated a lipid substance of Reiter's organism which reacted with reagin, the serum substance which reacts with ubiquitous tissue lipid or cardiolipin antigens (7-9). It therefore appeared that a suspension of Reiter's treponeme produced false-positive reactions and possessed no advantage over the use of tissue lipid antigens.

In addition to the lipid antigen of Reiter's organism, D'Alessandro and co-workers demonstrated the isolation of a thermolabile soluble protein antigen (antigene treponemico proteico

solubile) from the Reiter strain of *T. pallidum* (9). It was demonstrated that the substance reacting with the protein antigen was not reagin. The protein antigen was found to be reactive with the serum of yaws and syphilis and with Reiter antiserum. It was therefore postulated that the protein antigen represented a group-specific substance.

This report presents the method used for the isolation of protein antigen from the Reiter strain of *T. pallidum* and preliminary observations on the use of the antigen in a complement fixation test descriptively designated as the Reiter protein complement fixation (RPCF) test. RPCF test results on 1,380 serum specimens (765 syphilitic and 615 presumably non-syphilitic) are compared with results obtained with the *Treponema pallidum* immobilization (TPI) test and the *Treponema pallidum* complement fixation (TPCF) test.

The following techniques were used in the study:

TPI test: Nelson and Diesendruck (10) with added complement according to Thompson and Magnuson (11) and increased sodium thioglycolate as recommended by Portnoy, Harris, and Olansky (12).

TPCF test: Original procedure of Portnoy and Magnuson (13).

RPCF test: Kolmer one-fifth volume technique (14) without modification except that Reiter protein antigen was used in place of Kolmer antigen.

Mr. Cannefax is a bacteriologist with the Public Health Service Venereal Disease Experimental Laboratory at the University of North Carolina School of Public Health, Chapel Hill, N. C. Dr. Garson is director of the laboratory and head of the department of experimental medicine. Technical assistance in the study was given by Mrs. Dorothy H. Houser and Mrs. Marie B. Nifong.

Table 2. Sensitivity comparison (micrograms per milliliter)

| Element | Reactor 5×10^{11} flux | Reactor 10^{12} flux | Copper spark | Graphite direct cur- rent arc | Flame spec- tropho- tometer | Sensitive color reaction | Ampro- metric titration |
|-----------|---------------------------------------|---------------------------|-----------------|-------------------------------------|-----------------------------------|--------------------------------|-------------------------------|
| Magnesium | 0.6 | 0.03 | 0.01 | 0.1 | 1.0 | 0.06 | |
| Chlorine | .03 | .0015 | | | | .04 | 10.0 |
| Chromium | .2 | .01 | .05 | 2.0 | 1.0 | .02 | 1.0 |
| Manganese | .0006 | .00003 | .02 | .2 | .1 | .001 | .0003 |
| Iron | 0.0 | .45 | .5 | .2 | 2.0 | .05 | 2.0 |
| Copper | .007 | .0035 | | .2 | .1 | .03 | 10.0 |
| Zinc | .04 | .002 | 2.0 | 20.0 | 2,000.0 | .016 | 10.0 |
| Arsenic | .002 | .0001 | 5.0 | 10.0 | | .1 | .4 |
| Selenium | .05 | .0025 | | | | | 200.0 |

the isotope under investigation as a result of the decay of other radioactive species. However, this limitation may be overcome by determining decay and energy of emission.

Comparison With Other Methods

Meinke (6) has compared activation analysis with other means of trace analysis for elements from hydrogen to uranium. His findings on a few elements of importance in drinking water standards are given in table 2. For all of these except iron and magnesium, neutron activation analysis at a thermal neutron flux of 10^{12} is more sensitive than any of the other trace methods considered.

Its Future in Public Health

We believe that activation analysis has a future in public health laboratory operations. Sensitivity of the method is increasing with the development of higher flux reactors. In fact, Meinke reports that many scientists feel that activation analysis will be the ultimate method of analysis. Its use, of course, depends on the availability of nuclear reactors.

We suggest that the reader become more familiar with the method through the references given (2, 5-8) and determine whether it is a possible solution to his problem. An activation analysis service is presently available at the Oak Ridge National Laboratory for a nominal charge to industrial, academic, and govern-

mental institutions. Samples are sent to G. W. Leddicotte, Analytical Chemistry Division, Oak Ridge National Laboratory, P. O. Box P, Oak Ridge, Tenn. Following analysis, the results are returned to the sender in terms of micrograms per gram, parts per million, or other usable units, as requested. Additional information may be obtained by writing to the above address.

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the three tests, by stage of syphilis, is presented in table 2. The TPI test has the lowest percentage of positive results in cases of primary and secondary syphilis, 25.7 and 72.7, respectively, as compared with 62.9 and 89.7 for the TPCF test and 61.4 and 84.6 for the RPCF test. This difference, which is probably due to the fact that the TPI antibody appears later in the course of infection than do the other antibodies, accounts, in great measure, for the

generally lower sensitivity of the TPI test. When all diagnostic groups are combined, the positivity rates are 75.4 percent for the TPI test, 82.6 percent for the RPCF test, and 86.8 percent for the TPCF test.

The TPCF test had a 4.19 percent higher positivity than the RPCF test with this group of specimens. The difference in percentages was found to be of borderline significance when a normal deviate test of the percentage differ-

Table 1. Comparison of test results of 765 serum specimens from patients previously diagnosed as syphilitic and tested by TPI, TPCF, and RPCF tests

| Test result | | | Stage or type of syphilis | | | | | | | | | | | | | | All groups | |
|-------------|------|------|---------------------------|---------|-----------|---------|--------------|---------|-------------|---------|------------------------|---------|------------|---------|----------|---------|------------|---------|
| | | | Primary | | Secondary | | Early latent | | Late latent | | Central nervous system | | Congenital | | Tertiary | | | |
| TPI | TPCF | RPCF | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| + | + | + | 30 | 21.43 | 78 | 66.67 | 146 | 81.11 | 144 | 82.76 | 59 | 85.51 | 49 | 73.13 | 11 | 61.11 | 517 | 67.58 |
| + | + | - | 2 | 1.43 | 5 | 4.27 | 8 | 4.44 | 10 | 5.75 | 0 | 0 | 8 | 11.94 | 3 | 16.67 | 36 | 4.71 |
| + | - | + | 2 | 1.43 | 2 | 1.71 | 2 | 1.11 | 3 | 1.72 | 4 | 5.80 | 1 | 1.49 | 0 | 0 | 14 | 1.83 |
| + | - | - | 2 | 1.43 | 0 | 0 | 3 | 1.67 | 4 | 2.30 | 1 | 1.45 | 0 | 0 | 0 | 0 | 10 | 1.31 |
| - | + | + | 44 | 31.43 | 16 | 13.68 | 7 | 3.89 | 8 | 4.60 | 4 | 5.80 | 5 | 7.46 | 1 | 5.56 | 85 | 11.11 |
| - | + | - | 12 | 8.57 | 6 | 5.13 | 5 | 2.78 | 0 | 0 | 1 | 1.45 | 2 | 2.99 | 0 | 0 | 26 | 3.40 |
| - | - | + | 10 | 7.14 | 3 | 2.56 | 0 | 0 | 2 | 1.15 | 0 | 0 | 0 | 0 | 1 | 5.56 | 16 | 2.09 |
| - | - | - | 38 | 27.14 | 7 | 5.98 | 9 | 5.00 | 3 | 1.72 | 0 | 0 | 2 | 2.99 | 2 | 11.11 | 61 | 7.97 |
| Total..... | | | 140 | 100.00 | 117 | 100.00 | 180 | 100.00 | 174 | 100.00 | 69 | 100.00 | 67 | 100.00 | 18 | 100.00 | 765 | 100.00 |

TPI: *Treponema pallidum* immobilization.

TPCF: *Treponema pallidum* complement fixation.

RPCF: Reiter protein complement fixation.

Table 2. Relative sensitivity of the TPI, TPCF, and RPCF tests with 765 serum specimens, from patients diagnosed as syphilitic, by stage of syphilis

| Test | Stage or type of syphilis | | | | | | | | | | | | | | All groups | |
|-----------------|---------------------------|---------|-----------|---------|--------------|---------|-------------|---------|------------------------|---------|------------|---------|----------|---------|------------|---------|
| | Primary | | Secondary | | Early latent | | Late latent | | Central nervous system | | Congenital | | Tertiary | | | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| TPI ----- | 36 | 25.71 | 85 | 72.65 | 159 | 88.33 | 161 | 92.53 | 64 | 92.75 | 58 | 86.57 | 14 | 77.78 | 577 | 75.42 |
| TPCF ----- | 88 | 62.86 | 105 | 89.74 | 166 | 92.22 | 162 | 93.10 | 64 | 92.75 | 64 | 95.52 | 15 | 83.33 | 664 | 86.80 |
| RPCF ----- | 86 | 61.43 | 99 | 84.62 | 155 | 86.11 | 157 | 90.23 | 67 | 97.10 | 55 | 82.09 | 13 | 72.22 | 632 | 82.61 |
| All tests ----- | 140 | ----- | 117 | ----- | 180 | ----- | 174 | ----- | 69 | ----- | 67 | ----- | 18 | ----- | 765 | ----- |

TPI: *Treponema pallidum* immobilization.

TPCF: *Treponema pallidum* complement fixation.

RPCF: Reiter protein complement fixation.

Preparation of Antigen

The Reiter strain of *T. pallidum* was grown in modified Brewer's fluid thioglycolate medium (A) which was gently agitated during incubation by means of a magnetic stirring device. The dehydrated medium was dissolved in distilled water, allowed to stand overnight at 6° to 8° C., and filtered through filter paper to remove agar. The medium was sterilized by autoclaving at 15 pounds' pressure for 30 minutes in a 4-liter aspirator bottle. Horse serum was added to make a final concentration of 10 percent prior to inoculating a 4-liter bottle with 200 ml. of a 3-day culture of Reiter treponemes. The cultures were incubated at 37° C. for 4 to 6 days. The organisms were collected by centrifugation in a refrigerated anglehead centrifuge at 4,000 r.p.m. The sediment of treponemes was evenly suspended in physiological saline solution and washed three times to remove medium components.

Extraction of Protein Antigen

The washed treponemes were suspended in physiological saline solution in the proportion of 1 gm. of moist weight of sediment to 20 ml. of saline solution. The suspension was placed in stainless steel centrifuge cups and rapidly frozen at -70° C. in a mixture of dry ice and alcohol. After complete freezing (5 minutes) the tubes were thawed with continuous agitation in a 37° C. water bath. After 15 freeze-thaw cycles the suspension was centrifuged in the cold at 10,000 r.p.m. for 1 hour. The residual sediment of treponemes was then resuspended in fresh saline solution in the proportion of 10 ml. for each gram of original moist weight of organisms. The whole procedure of cryolysis was repeated five times, making a total of 75 freeze-thaw cycles. The end product of cryolysis was approximately 60 ml. of opalescent fluid, which was placed in cellophane dialysis tubing.

Dialysis was started by placing the tube on a rotating device and suspending the tube in a 10 percent saturated ammonium sulfate solution (pH 7.2 to 7.4) at 6° to 8° C. for 8 hours. The ratio of ammonium sulfate solution to cryolysate was approximately 20 to 1. Every 8 hours the ammonium sulfate solution was re-

placed by one of 10 percent greater concentration until a 50 percent saturated ammonium sulfate solution was reached. Dialysis against the 50 percent saturated solution was allowed to continue overnight. The 50 percent saturated solution was replaced by one of 75 percent saturation and dialyzed for 8 hours. The 75 percent saturated solution was replaced by a fresh 75 percent saturated solution and dialysis was continued for another 8 hours. The dialysate was then transferred to a centrifuge tube and centrifuged at 10,000 r.p.m. for 30 minutes. The supernatant was removed and the protein, which had precipitated during dialysis, was dissolved in physiological saline solution in the proportion of 2 ml. of saline solution for each gram of original moist weight of treponemes. The protein solution was then dialyzed for 96 hours against physiological saline solution in the proportion of 2,000 ml. of saline solution for each 2 ml. of protein solution. It was then centrifuged for 30 minutes at 10,000 r.p.m. in an anglehead centrifuge in the cold. The supernatant, Reiter protein antigen, was stored in the refrigerator without preservative.

The method given for the preparation of Reiter protein antigen is the same as that of D'Alessandro and Dardanoni (15) except that the precipitate was put into solution and dialyzed against saline solution whereas phosphate buffer was used in the original method. Also, in the original method, merthiolate, 1:5,000, was added for preservation whereas here no preservative of any kind was included.

It should be noted at this point that, in lieu of the cultured source of organisms and the means of obtaining the protein fraction, the RPCF antigen is relatively simple to produce and quite inexpensive when compared with the antigens of treponemal tests currently in use.

Results

Table 1 shows results obtained by each test procedure on 765 serum specimens from patients diagnosed as having syphilis, by stage of disease. These data are summarized in tables 2 and 3.

The relative sensitivity (percent reactive) of

the complement titration methods were the same. The RPCF test would have been more sensitive had $1\frac{1}{2}$ exact units of complement been used in the test. It cannot be speculated what overall effect this would have had on the relative sensitivity or specificity of the RPCF test. This aspect of the test is the subject of further investigation.

The determination of specificity of one test in relation to other tests, in the absence of clinical information, is admittedly fallacious. It presupposes the 100 percent detection by the control tests of antibodies to syphilis infection. That this is not true is substantiated by an examination of the results of testing shown in table 2 in which patients with previous diagnoses of syphilis were found to be seronegative with both the TPI and TPCF tests. The occurrence of a positive reaction with one test and a negative reaction with another, with the same specimen, is, of course, a common observation in syphilis. This appears to be the case with at least 7 of the 10 presumably nonsyphilitic patients with positive RPCF test results on whom clinical information was obtained. The clinical status of the other 4 patients positive with the RPCF test and negative with both the TPI and TPCF tests has not been learned, and the possibility exists that some, or all, of these may have had previous diagnoses of syphilis. Therefore, it appears that the 98.86 percent specificity established in relation to the TPI and TPCF tests, with the specimens tested in this report, may represent the minimum rather than the maximum percentage of specificity of the RPCF test.

This preliminary investigation suggests that more intensive study and evaluation of the usefulness and limitations of Reiter protein antigen in the serology of the treponemal infections are indicated.

Conclusions

1. The RPCF test has, in this study, a relative specificity of 98.86 percent in comparison with the TPI and TPCF tests.

2. The RPCF and the TPCF tests appear to have similar percentages of overall sensitivity: TPCF test, 86.80 percent; RPCF test, 82.61 percent.

3. The RPCF test and the TPCF test detected, in this study, a higher percentage of primary and secondary syphilis cases than did the TPI test.

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ences was applied. A normal deviate value of 1.96 is considered significant at the 5 percent level and a value of 2.28 was obtained. Statistically, these data do not present strong evidence of a greater general sensitivity with the TPCF test.

The relatively low positivity rate of the TPI test in primary syphilis is also reflected in table 3, which shows the percentage of agreement between the pairs of tests. In primary syphilis there was 81.4 percent agreement between the TPCF and RPCF tests, as opposed to 57.1 percent agreement between the TPI and TPCF tests and 58.6 percent agreement between the TPI and RPCF tests. In secondary syphilis there also appeared to be greater agreement between the TPCF and RPCF tests. The difference here, however, is not statistically significant nor are any of the differences observed following the secondary stage.

The 615 presumably nonsyphilitic serum specimens used for the determination of the relative specificity of the RPCF test were specimens which gave negative results to the TPI and TPCF tests in a serologic survey in an area with a high incidence of syphilis. Nothing was known of the clinical status of the patients at the time of the serologic survey or at the time of RPCF testing. Fourteen of the 615 specimens gave positive results in some degree with the RPCF test. This indicates a specificity of 97.72 percent in relation to the TPI and TPCF tests. Clinical information was subsequently obtained on 10 of these 14 patients. Seven had been previously diagnosed and treated for syphilis, and three denied

a past history of syphilis. Subtracting the seven patients with a previous diagnosis of syphilis, the specificity percentage becomes 98.86. Clinical information on the remaining four patients is not currently available.

Discussion

It has become a serologic axiom that tests employing Reiter's treponeme produce a high percentage of false-positive reactions. This preliminary investigation of a protein fraction of Reiter's organism (presumably free of lipid antigen substance which reacts with reagin) does not produce a high percentage of false-positive reactions when compared with the TPI and TPCF tests.

The only other investigation, to our knowledge, of a comparison of Reiter protein antigen with a specific test (TPI) is the work of J. H. de Bruijn of the National Institute of Public Health, Utrecht, Netherlands (16). His results with 116 syphilitic and 137 presumably nonsyphilitic serum specimens compare favorably with the results of this investigation.

The preliminary experimental data reported here, though not adequate for definitive evaluation, indicate that the RPCF test approximates, percentagewise, the degree of detection of syphilis, or relative sensitivity, afforded by the TPCF test. In relation to this comparison of sensitivity, it should be pointed out that the TPCF test and the RPCF test procedures were similar except that the TPCF test employed 1½ exact complement units whereas the RPCF test employed 2 exact complement units in which

Table 3. Percentage agreement¹ between pairs of tests in each stage of syphilis

| Test combinations | Stage or type of syphilis | | | | | | | Group combinations | |
|-------------------|---------------------------|-----------|--------------|-------------|------------------------|------------|----------|--------------------|------------------------------|
| | Primary | Secondary | Early latent | Late latent | Central nervous system | Congenital | Tertiary | Primary-secondary | All except primary-secondary |
| TPCF-RPCF----- | 81.43 | 86.32 | 91.67 | 91.38 | 92.75 | 83.58 | 77.78 | 83.66 | 90.16 |
| TPI-TPCF----- | 57.14 | 79.49 | 90.56 | 91.38 | 85.51 | 88.06 | 94.44 | 67.32 | 89.96 |
| TPI-RPCF----- | 58.57 | 79.49 | 90.00 | 86.21 | 92.75 | 80.60 | 72.22 | 68.09 | 87.20 |

¹ Positive and negative.

TPI: *Treponema pallidum* immobilization.

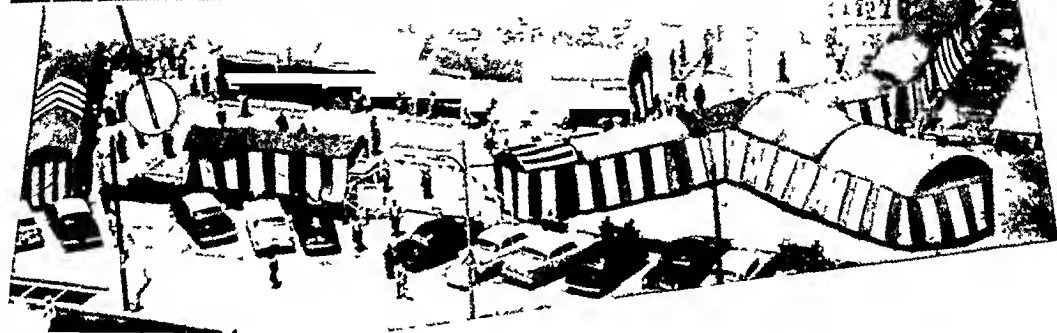
TPCF: *Treponema pallidum* complement fixation.

RPCF: Reiter protein complement fixation.

THE

Philadelphia

HEALTH FAIR



What are the results achieved by a health fair? Pursuit of this question produced several findings which materially contributed to the effectiveness of subsequent fairs.

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PHILADELPHIA'S three health fairs, the first in 1954 and the latest in 1956, were the setting for an illuminating experience in the evaluation of health education techniques. This story about the effectiveness of the health fair in bringing community agencies together provides a valuable footnote to this experience.

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The Philadelphia Junior Chamber of Commerce invited official and voluntary agencies and professional societies to help plan the first health fair in Philadelphia and the first health fair in any large city. That was in 1952.

Early in 1954, when leadership and financing seemed certain, the Jaycees organized a steering committee, formed the nucleus of an executive committee, and appointed a treasurer and legal consultant.

The city department of public health, the health and welfare council, the board of public education, and county medical, dental, and nursing societies were among the agencies represented on the steering committee. The de-

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PHS films

Collections of Specimens For Virus Studies

35 mm. filmstrip, color, sound, 9½ minutes, 58 frames, 1956.

Audience: Public health personnel, practicing physicians, clinical technicians.

Availability: Loan—Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

Methods of collection, preservation, and packing of specimens sent to the laboratory for virus diagnosis are explained in this filmstrip, which shows the type of specimens of

value and emphasizes the importance of timely collection.

Procedures for rapid preservation are demonstrated. Types of shipping containers are suggested and precautions in packing to insure against damage in transit are given. The film ends with emphasis on the necessity of sending complete data with the specimen.



Poultry Hygiene Series

Refrigeration Waste Disposal, Cleanup, and Basic Sanitation

35 mm., filmstrips, color, sound, 11 and 12 minutes and 39 and 72 frames, respectively, 1956.

Audience: State poultry inspectors and sanitarians, poultry plant supervisors and others concerned with the processing of poultry.

Availability: Loan—Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

Two more films of the poultry hygiene series have been released (see Pub. Health Rep. 71: 1080, November 1956). One depicts the essentials of waste collection, holding, and dis-

posal; the time and procedures for cleanup of processing rooms and equipment; and basic sanitation in the poultry processing plant and on the premises. The other film follows the processed bird through the plant to the retail market. It outlines the refrigeration temperatures and procedures during processing, storage, and transport.



near the main entrance, where it served as the center of administrative operations.

The publicity committee employed a local public relations agency to issue news releases to metropolitan and neighborhood newspapers, to write television and radio announcements, and to publicize news events related to the fair. News releases began several weeks before the fair, built to a high pitch at the opening, continued throughout the week of the event, and ended in a final roundup of pictures and stories.

The stage of the bandshell served as the focal point for the various programs, designed to draw attendance and entertain as well as to educate. A master of ceremonies announced programs, called attention to future demonstrations, and told the audience about the objectives of the fair and its sponsors. A nurse-of-the-year award, band concerts, pageants, and talks by the health commissioner, the presidents of the medical and dental societies, and other health authorities were included in the staged program.

Shortly after the fair, the agencies and committees evaluated the effectiveness of their own contributions and exchanged this information for use in planning the next year's fair.

Although planning of the second health fair represented an improvement over the initial efforts, committee members agreed that further improvement was desirable. Three weeks before the opening the executive committee requested assistance from the Public Health Service in planning an objective evaluation of the educational effectiveness of the fair. Committee members felt that the request should be made even though the time for planning was short. The Public Health Service agreed to help.

The community objectives for the 1955 fair were the same as those for the first fair. Obviously, any attempt to measure success in achieving these in a metropolitan area would face formidable obstacles.

Evaluation Process

In view of those obstacles, an attempt was made to evaluate progress by a method described in detail elsewhere (1). In brief, it

measures success with intermediate objectives that are importantly related to long-range objectives.

The short time available for planning imposed certain limitations on the evaluation. No evaluation of the long-range objectives was attempted even though certain of these might have been closer to realization than certain intermediate objectives; neither was there an attempt to measure the success of the fair in improving working relationships among the local health agencies, a result that seemed implicit in the production of the fair.

Accordingly, the executive committee agreed that evaluation would be confined to the following intermediate objectives:

1. For long-range objective *b*, noted above, the intermediate objective was to foster participation in the health tests planned for the fair.

2. For long-range objective *c*, the intermediate objective was to increase knowledge of community health services.

To evaluate success with these objectives, we interviewed persons entering and leaving the fair. Those interviewed on entering were not interviewed on leaving. Differences in knowledge between the two groups could be attributed to experience with the health fair. Through open-end questions, respondents would have an opportunity to discuss their impressions of the fair. In all, 215 adults were questioned on entrance and 202 on departure. The interviews, conducted by volunteers, students from Temple University, lasted 5 to 15 minutes.

The following summary lists the main points in the evaluation:

1. Nearly half (48 percent) of the fair visitors took at least 1 health test, and a fourth took 2 or more. No person took more than 4 tests.

2. In general, more men, more younger people, and more highly educated people visited the fair than would be expected on a purely random basis. Less well-educated people, older people, and, to some extent, women did not attend the fair in proportion to their numbers in the local population.

3. Evaluation of the fair objectives makes it clear that the long-range objectives were

cisions of this group were carried out by Jaycee and health agency co-chairmen of committees on arrangements, exhibits, program, publicity, and manpower. The fair was financed on a budget of \$10,300 by contributions from the participating agencies and the local Blue Cross.

The Health Education Committee of the Philadelphia Health and Welfare Council was an important catalyst in the initial planning. This committee, which included health educators from a number of local agencies, provided valuable aid in developing the fair as a communitywide activity in health education.

The fair had three major objectives for the public and three for the participating agencies.

For the public, the long-range objectives were (a) to create increased health consciousness through understanding of community and personal health problems, (b) to stimulate the practice of preventive medicine and periodic health examinations, and (c) to urge use of health services and other community facilities.

The immediate objectives for the participating agencies were to provide opportunities for cooperative effort in health promotion, for agency workers to meet the public face to face, and for health counseling. In addition, the agencies hoped that the publicity accompanying the fair would have educational significance beyond the fair itself.

Health fairs and health weeks, promoted by junior chambers of commerce and local health councils, are attracting enthusiastic interest throughout the country. Although this trend in health education is gaining momentum, little effort has been made to evaluate its effect on the public and the participating agencies. The Philadelphia experience illustrates the need for critical evaluation.

History of the Fairs

The first fair was held May 15-22, 1954, from 11 a. m. to 9 p. m. daily, in Reyburn Plaza, an open court opposite City Hall in the heart of Philadelphia. Health tests and exhibits presented by 40 agencies were housed in gay canvas booths. A large tent served as a film theater.

Despite one day of unfavorable weather, 52,000 persons attended the fair, and more than

7,000 received chest X-rays, blood and hearing tests, diet evaluations, height and weight measurements, and tests of strength and skill. Public reaction was favorable.

Sponsors of the fair decided that it should, if possible, be a yearly event. Most of the agencies felt that the major objectives had been accomplished fairly well though some adverse opinions were expressed regarding street noise and the difficulty in handling the flow of visitors. The consensus was that the location had been satisfactory.

Tentative plans were made late in 1954 for a second fair. The executive committee was broadened to include more members from voluntary and official health agencies. Two new committees were added, one to expand the health testing program and one to promote attendance through community groups. Again, financing was through contributions from participating agencies. The budget was \$12,250. This fair was scheduled for the same location at the same hours as in 1954, but the fair week was shortened to 6 days, May 16-21, 1955.

Aided by a week of favorable weather, attendance in 1955 climbed to an estimated 80,000 (28,000 over the first year), and the number of health tests given exceeded 20,000. Increased newspaper and radio coverage, expanded testing, improved exhibits, and more extensive programming helped increase attendance also. Forty-one agencies presented exhibits, demonstrations, health tests, films, and programs.

Organization and Operation

The health fair required days and hours of spade work by the groups and agencies that conceived the idea and by the committees and numerous subcommittees. In addition to determining policy regarding arrangements for exhibits, publicity, and financing, the steering committee developed the objectives, opened communication lines, and advised on problems in professional relationships. Presentation of the fair was the responsibility of the executive committee. To coordinate planning for the forty-odd agencies and to handle the details of booth construction and rental, the executive committee hired a fair manager 3 months before the fair. The manager's booth was located

illustrated with large, clear photographs often attracted study. Demonstrations and other eye-catchers increased attendance at exhibits.

Are the exhibits and health tests staffed by attendants qualified to provide desired information or make needed referrals?

Attendants at exhibits should be well informed about the functions of their own agency, the purposes of the exhibit they represent, and the objectives of the health fair. They should be able also to refer inquiries to other sources of information. Orientation can be accomplished by the agency itself and by a general briefing for all attendants.

Incomplete information on the part of persons administering the health tests may have contributed to the failure of some fair visitors to identify health tests when they were questioned on leaving the fair. One test in particular was interpreted inadequately and resulted in undue concern over failure to attain an average score.

Those giving health tests should receive short, intensive training to familiarize themselves with the purposes of the test, its limitations, and the exact interpretation of the results. Explanatory pamphlets and posters will support the explanations by the attendant.

Misconceptions result from failure to explain the health tests. For example, some individuals confuse a test for diabetes with a test for venereal disease. Listing all tests on the program and posting the list in a conspicuous place will tend to relieve such confusion.

Are presentations readily accessible?

Exhibits, health tests, and other presentations should be accessible to everyone. Lanes between rows of booths should provide for an unobstructed flow of traffic. If it is necessary to keep lines of people waiting to take tests and view exhibits, the lines should be arranged to avoid blocking other displays. Announcements over a public address system aid in directing visitors to uncrowded exhibits and tests.

Have the programs had careful planning?

In general, the main objective of health fair programs is to motivate good health practices.

One method of developing a program is to plan with agencies contributing to the chosen theme. Each minute in a program should be planned to contribute to the objectives.

The Learning Process

Health education studies have shown that what people learn reflects their immediate personal interests and concern. Simply stated, a hungry man notices a restaurant that a satiated person might overlook. In general, without motivation, learning does not proceed. Other studies have shown that the pattern or organization of motives in people is quite individual and perhaps unique.

What implications do these facts have for a health fair?

In any group of people assembled at a fair, some will not be motivated by the subject or theme. Others may be strongly motivated in areas served by some of the material but not as much in others. Since patterns of motives, as well as learning capacities, are individual, each person would be expected to learn at his own pace and in his own direction.

On the basis of these principles, it could be predicted that the amount of information gleaned from the wealth of material at a health fair would vary from person to person. Also, no individual would learn exactly what is learned by any other. A health fair cannot be equally successful for all participants, nor is it at all successful for some.

One might maintain that moderate success might still be achieved with individuals who have a personal concern with health. This would be true if enough people had such concern and if the material presented were appropriate. Preliminary explorations, however, suggest that relatively few people have concerns that they identify with the need to improve health practices. Of course, the health worker knows that a person's health status strongly influences his ability to function and obtain what he wants, but most people either do not know this or behave as if they do not know, with gross indifference to their health.

These problems pose a difficult question for health educators. How can we help people improve health practices when they do not believe they have health needs?

such that the limited educational activity of the health fair could not reasonably be expected to achieve them by itself.

4. Within the limitations of the design of the inquiry, it could not be shown conclusively that the fair succeeded in increasing knowledge about local health services.

The intermediate objectives, as stated, were not met in full. In view of this, the participating agencies recognized the need for more realistic objectives. Agency discussion of the evaluation resulted in a review of individual and group philosophies of health education, a greater appreciation of the need for evaluating other efforts at health education, and immediate plans to exploit more effectively the education potential of the fairs. Self-evaluation by the participating agencies indicated that most felt they had progressed toward goals. Some reported that use of their services increased following the fair.

Implications for the Future

The findings of the evaluation have many implications. In this context, it is less important to ask whether 48 percent participation in health tests met expectations than it is to ask how to increase participation. Similar questions may be asked about the other findings.

Are program objectives realistic and can they be achieved?

Specific objectives should be agreed upon by all participants early in the planning stage. Evaluation of a program seldom can be effective if objectives are vague. For evaluation to be effective, long-range objectives essential to initial planning must be associated with realizable short-term objectives. This process can be facilitated by including persons responsible for the evaluation early in the discussions.

What audience are we trying to reach?

Identification of the desired audience should be made early because the entire process is colored by that decision. The nature of the Philadelphia health fair, with its wide range of messages, made it difficult to identify a specific audience, although adults were more desired than youngsters. It was felt that chil-

dren, welcome of course, receive health education more effectively through schools.

The location of the fair, in the heart of the city, and the means used to promote it explain in part the presence of relatively large numbers of young people, men, and visitors of relatively extended schooling. The fair, with its gaiety and hubbub, naturally attracted many visitors who were in the neighborhood. When asked how they happened to come to the fair, the men, the young people, and those with extended schooling responded much more frequently than others that they were motivated by seeing the fair itself. This supports the idea that the sight and sound of the fair will bring more visitors than advertisement in the newspapers. The less extensively schooled, the older adults, and, to a lesser degree, women, tended to stress newspapers and public advertising as their reason for attending the fair. This occurred despite the fact that these groups probably had less exposure to these forms of public communication than the others. Had the fair been held in another part of the city, quite different groups might have attended.

Findings on the nature of the audience should not be attributed to the single factor of location. In tuberculosis case-finding programs, participation is poorest in precisely the same population groups whose attendance was poorest at the health fair. Hochbaum (2) suggests that differences in motivation also may help to account for the nature of the audiences.

Do the exhibits permit rapid inspection and learning?

The 1955 health fair included exhibits, health tests, films, and health programs. Although to view all the exhibits, films, and programs and participate in all tests would undoubtedly have required several hours, the median amount of time spent at the fair was only 45 minutes, or only 1 minute for each of the presentations offered. There is no reason to believe, however, that an individual could not have had a satisfactory learning experience if he had spent the 45 minutes in taking 2 or 3 health tests, viewing a film, and seeing several exhibits.

Exhibits that were top heavy with copy received little attention, but displays consisting of only a few lines of carefully edited copy and

activities. Additional critical evaluation may give information about the value of health fairs to a community, their priority in health education, and their opportunities for providing individual consultation. Although their value in building relationships and improving cooperation among community agencies seems evident, their educational values for the public are not certain.

Through further research, it may be possible

to determine the educational potential of the health fair and discover effective ways of realizing such potential.

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technical publications

Research and Training Grants and Awards of the Public Health Service

Information Statement

PHS Publication No. 415. Revised, October 1956. 29 pages.

Included in this revised brochure are several new programs initiated subsequent to July 1956, such as health research facilities, senior research fellowships, and mental health career teacher grants. It has, in addition, information on research grants, field investigation grants, career investigation grants, research fellowships, traineeships, and training grants.

The booklet describes liberalized policy governing the budgeting of funds and the use of unexpended funds in approved grants, and reflects the increase in stipends under the traineeship and research fellowship programs.

The Public Health Service in Occupational Health

PHS Publication No. 490. 1956. 16 pages; illustrated. 20 cents.

This booklet describes the work of the Public Health Service in its 40 years of research in occupational

health hazards. Photographs depict various phases of program operation, and the narrative material is intended for a general rather than a specialized audience.

The publication points out that, while great strides have been made in eliminating occupational disease in the past century, new hazards are posed by materials and processes being constantly introduced by a dynamic technology.

Occupational Health Program activities now encompass research and field studies, promotion of preventive health services in industry, and training and consultation services, all directed toward achievement of greater health protection for the production force of the Nation.

Citizen Participation in Public Welfare Programs Supplementary Services by Volunteers

Social Security Administration. By Evelyn G. Weller and Elizabeth B. Kilborne. 1956. 46 pages. 20 cents.

Addressed to the staffs of State and local welfare agencies, this booklet aims to encourage agency personnel to provide more opportunities for citizen participation in community service.

The publication discusses supplementary services and offers suggestions for developing volunteer services and for the orientation, training, and supervision of citizen volunteers.

Other social agencies interested in initiating or extending volunteer services will also find the discussion helpful.

National Library of Medicine

PHS Publication No. 507. 11 pages.

Services of the National Library of Medicine, formerly the Armed Forces Medical Library, are listed in this folder. Included are library hours; loan procedures; and photo-duplication, reference, translation, history of medicine, art section, and publication services.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

In general, it appears necessary to plan health programs in such a way that the unique needs or motives of each individual can be served insofar as possible. Efforts should be made to tie in with whatever personal needs the individual believes he has. Program development must be based on valid information about the concerns of persons whose cooperation is sought. Health consultation by a well-informed staff at the fair booths offers the possibility of uncovering some of these needs, and, at least partially, of meeting them.

Theory Into Practice

Theories developed from the 1955 evaluation became practice in 1956, when the third annual health fair was held October 12-13 and 15-18 in Reyburn Plaza. The evaluation had provided definite guidelines for presenting exhibits and tests. As a result visitors were given a better opportunity to learn about personal and community health, and the services of health and welfare agencies.

More realistic short-term objectives were developed along with suggestions to participants for achieving them.

Store window posters and mass distribution of fliers were not used to promote the fair because the evaluation had shown them to be of limited value in attracting an audience.

A subcommittee on volunteer training was organized to assure that attendants at the booths were better informed about the health tests, the exhibits, the fair in general, and their own agency in particular.

On the recommendation of the volunteer training committee, each agency provided descriptive material on its services for the use of persons staffing the booths and a list of community resources to assist them in making referrals.

The cancer society, the department of public health, and many of the other agencies met with the staff members and volunteers who were to man their health tests and exhibits.

These meetings provided facts about the fair sponsors: background, history, functions, and purposes; why the particular agency was taking part; its relationship to other agencies; and the value of health consultation.

Organizations presenting health tests explained to their staff members the purposes and limitations of the tests, how those examined would learn of the results, and where tests are available regularly.

Because the evaluation had pointed up the need, special efforts were made to improve interpretation to those examined of results of the tests.

Mimeographed sheets, listing the purpose of the particular test, what constitutes a normal result, and the mechanics of followup, were distributed at the fair.

A sign posted near the clinitron, the device for testing sugar content of blood, explained that a blue color in the test sample meant a normal condition and that a colorless sample indicated possible diabetes. In this way, people viewing the operation of the clinitron could watch the progress and final result of a test. The use of leaflets and signs in front of booths reduced anxiety about test results and gratified curiosity.

Spot checks at the 1956 fair revealed that persons staffing the booths were better informed about exhibits, tests, and agency and health fair purposes than in the preceding year.

Summary and Conclusions

To summarize the Philadelphia experience with three health fairs, we would say that in planning a health fair or any other health education activity it is necessary to set realizable short-term objectives as well as long-range objectives. The attainment of these will provide encouragement to participating groups. Persons responsible for evaluation should be included as early as possible in program planning. By making evaluation results available to all concerned—in Philadelphia these were the sponsoring and participating agencies—programs in the future can be improved.

The location of the fair greatly determines who will attend. Fairs should use proved techniques for attracting an audience and motivating it to positive steps. Careful instruction is essential for those who are to give the health tests and explain exhibits to visitors.

A health fair may be viewed as a project which is linked with other community health

Table 1. Number and percentage of patients with malignant neoplasms, according to site, by race, Tennessee tumor clinics, 1947-49

| Site | Total | | White | | Negro | |
|-----------------------|--------|---------|--------|---------|--------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| Total | 2,476 | 99.9 | 1,645 | 100.1 | 831 | 100.1 |
| Buccal cavity | 199 | 8.0 | 159 | 9.7 | 40 | 4.8 |
| Digestive organs | 199 | 8.0 | 117 | 7.1 | 82 | 9.9 |
| Respiratory system | 82 | 3.3 | 67 | 4.1 | 15 | 1.8 |
| Breast | 309 | 12.5 | 151 | 9.2 | 158 | 19.0 |
| Female genital organs | 624 | 25.2 | 287 | 17.4 | 337 | 40.6 |
| Male genital organs | 103 | 4.2 | 54 | 3.3 | 49 | 5.9 |
| Skin | 652 | 26.3 | 628 | 38.2 | 24 | 2.9 |
| Other | 308 | 12.4 | 182 | 11.1 | 126 | 15.2 |

Percentage distributions by site for a broader group of patients are available for two other southern areas for recent years, Atlanta, Ga., 1947 (1), and Birmingham, Ala., 1948 (2). The Atlanta and Birmingham studies include cancer patients seen, diagnosed, treated, or under observation by hospitals, clinics, and physicians while the Tennessee cases are made up entirely of clinic patients. Although not strictly comparable, the data for the three studies are offered in table 2 and figure 3.

As would be expected, the percentage distributions by site seem about the same for the

Figure 1. Percentage of cancer cases admitted to tumor clinics, by site, Tennessee, 1947-49.

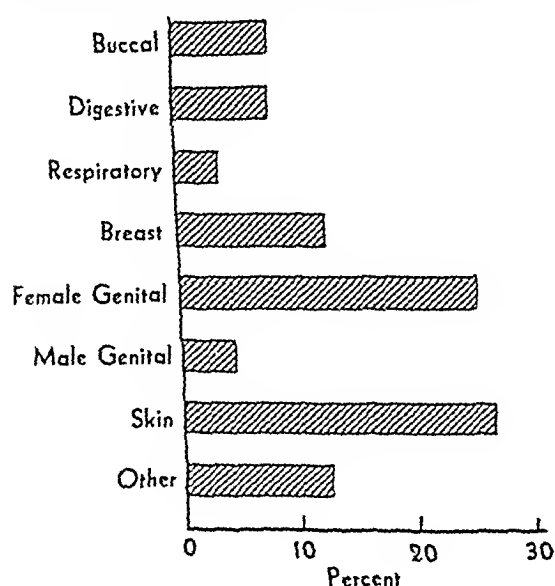
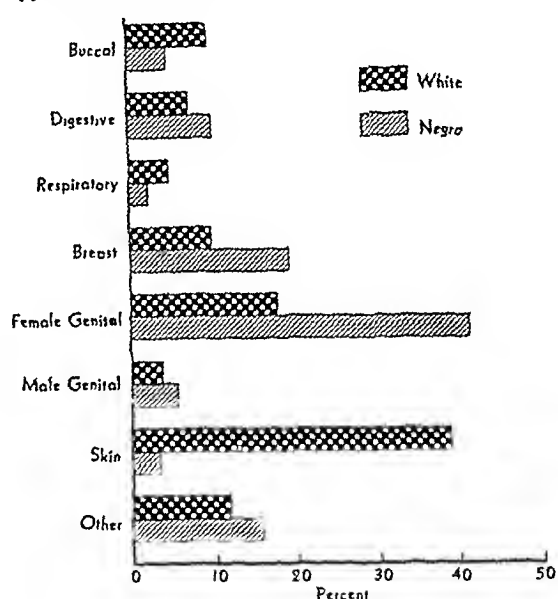


Figure 2. Percentage of cancer cases admitted to tumor clinics, by site and race, Tennessee, 1947-49.



Atlanta and Birmingham areas, but they differ from those for Tennessee. A larger proportion of the patients admitted to the Tennessee clinics had cancer of the buccal cavity, breast, and female genital organs. The percentage with cancer of the digestive organs was about one-half that of the Atlanta and Birmingham areas. The percentages were approximately the same for the respiratory system, male genital organs, and skin. One-fourth of the cancers in each of these three areas were of the skin.

In general, it seems that the clinic patients in Tennessee sought medical aid more often for

Life Experience of Cancer Patients in Tennessee Tumor Clinics

By SARA LOU HATCHER, M.A.

A STUDY of patients admitted to cancer clinics in Tennessee was begun by the Tennessee Department of Public Health in 1947. The purpose was to study the life experience of these patients according to type, site, and extent of the malignant neoplasms and other variables such as sex and age.

For the collection of data, the clinics complete a summary record for every patient admitted for the first time with a malignant neoplasm and send the record to the Tennessee Department of Public Health. The upper half of the record has identifying data, classification of the findings by type, site, and extent, and a summary of the treatment. The lower half provides space for recording the status of the patient at yearly intervals after diagnosis. For information regarding status of patients (living or dead), the clinic is queried at yearly intervals after diagnosis. If the clinic is unable to give the status of the patient, a query is sent to the health department in the county where the patient is a resident. Also, data regarding cause of death are obtained from death certificates and are entered at the bottom of the record.

Followup data are available for 5 years for patients admitted to the participating clinics in 1947, 1948, and 1949. The factors considered in this discussion are the site and extent

of the malignant neoplasms and the race of the patient. It is realized that other factors, such as age and sex, may influence the probability of death from cancer, and plans are in progress to include these in a more extensive report.

There were 2,476 patients with malignant neoplasms admitted to the clinics during the 3 years 1947, 1948, and 1949. Of these, 1,645 (approximately two-thirds) were white, and 831 (one-third) were Negro patients. The distribution of the patients according to the site of the cancer is shown in table 1 and figure 1. Cancer of the skin and female genital organs accounted for more admissions than any other site, with approximately one-fourth of all admissions for each. Other sites in order of frequency were breast, buccal cavity and digestive organs, male genital organs, and respiratory system. Cancer of all sites for which less than 75 persons were admitted were included in the "other" group. This group includes cancers of the urinary system, brain, bone, lymphatic system, and so forth.

The percentages by site vary according to race (table 1, fig. 2). The two most common cancer sites for the white patients were the skin and female genital organs. For the Negroes they were the female genital organs and breast. Nearly two-fifths (38.2 percent) of the white admissions were for cancer of the skin while only 2.9 percent of the Negro patients admitted had skin cancer. About 41 percent of the Negroes had cancer of the female genital organs compared with 17.4 percent of the white patients.

Miss Hatcher, a senior statistician in the Tennessee Department of Public Health, presented this paper at the meeting of the Southern Branch of the American Public Health Association in Tulsa, Okla., in April 1956.

nearly 50 percent had regional involvement; and in approximately 30 percent remote metastasis was present.

Probability of Death

The preceding discussion has dealt with the characteristics of the cases admitted. The remainder of this paper will be concerned with the probability of survival or death of these

patients according to site and extent of the malignant neoplasms at the time of admission and the race of the patient.

The rates for probability of death have been obtained by the adaptation of life table methods used for tuberculosis patients (3) and recommended by Berkson (4) for survival and death rates of cancer patients. By this method each person whose status is known is considered as being at risk of death for the year of observa-

Table 3. Number and percentage of white and Negro patients with malignant neoplasms, according to site, by known extent, Tennessee tumor clinics, 1947-49

| Site | Total | | Localized | | Regional involvement | | Remote metastasis | |
|----------------------------|--------|---------|-----------|---------|----------------------|---------|-------------------|---------|
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| <i>White</i> | | | | | | | | |
| Total..... | 1,133 | 99.9 | 476 | 42.0 | 422 | 37.2 | 235 | 20.7 |
| Buccal cavity..... | 115 | 100.0 | 43 | 37.4 | 49 | 42.6 | 23 | 20.0 |
| Digestive organs..... | 88 | 100.0 | 17 | 19.3 | 38 | 43.2 | 33 | 37.5 |
| Respiratory system..... | 55 | 100.0 | 14 | 25.5 | 19 | 34.5 | 22 | 40.0 |
| Breast..... | 126 | 100.0 | 20 | 15.9 | 80 | 63.5 | 26 | 20.6 |
| Female genital organs..... | 221 | 100.0 | 30 | 13.6 | 115 | 52.0 | 76 | 34.4 |
| Male genital organs..... | 47 | 100.0 | 11 | 23.4 | 21 | 44.7 | 15 | 31.9 |
| Skin..... | 396 | 100.0 | 312 | 78.8 | 70 | 17.7 | 14 | 3.5 |
| Other..... | 85 | 100.0 | 29 | 34.1 | 30 | 35.3 | 26 | 30.6 |
| Excluding skin..... | 737 | 100.1 | 164 | 22.3 | 352 | 47.8 | 221 | 30.0 |
| <i>Negro</i> | | | | | | | | |
| Total..... | 621 | 100.0 | 124 | 20.0 | 297 | 47.8 | 200 | 32.2 |
| Buccal cavity..... | 28 | 100.0 | 6 | 21.4 | 14 | 50.0 | 8 | 28.6 |
| Digestive organs..... | 62 | 100.0 | 6 | 9.7 | 19 | 30.6 | 37 | 59.7 |
| Respiratory system..... | 12 | 99.9 | 1 | 8.3 | 4 | 33.3 | 7 | 58.3 |
| Breast..... | 142 | 100.0 | 22 | 15.5 | 93 | 65.5 | 27 | 19.0 |
| Female genital organs..... | 250 | 100.0 | 51 | 20.4 | 118 | 47.2 | 81 | 32.4 |
| Male genital organs..... | 38 | 100.0 | 9 | 23.7 | 13 | 34.2 | 16 | 42.1 |
| Skin..... | 20 | 100.0 | 8 | 40.0 | 9 | 45.0 | 3 | 15.0 |
| Other..... | 69 | 99.9 | 21 | 30.4 | 27 | 39.1 | 21 | 30.4 |
| Excluding skin..... | 601 | 100.0 | 116 | 19.3 | 288 | 47.9 | 197 | 32.8 |

Table 4. Percentage of patients with malignant neoplasms dying during first 5 years of observation, by site, Tennessee tumor clinics

| Site | First year | First 2 years | First 3 years | First 4 years | First 5 years |
|----------------------------|------------|---------------|---------------|---------------|---------------|
| Total..... | 33.4 | 45.9 | 53.8 | 58.7 | 62.4 |
| Buccal cavity..... | 36.5 | 51.5 | 57.4 | 61.9 | 65.4 |
| Digestive organs..... | 64.5 | 74.7 | 79.3 | 83.9 | 85.9 |
| Respiratory system..... | 65.4 | 73.1 | 75.7 | 79.5 | 80.9 |
| Breast..... | 29.2 | 45.2 | 55.4 | 62.9 | 66.5 |
| Female genital organs..... | 36.0 | 51.4 | 59.7 | 63.2 | 66.5 |
| Male genital organs..... | 31.4 | 45.3 | 55.5 | 63.3 | 69.5 |
| Skin..... | 10.8 | 19.9 | 26.4 | 31.6 | 36.6 |
| Other..... | 49.8 | 62.1 | 72.7 | 77.3 | 80.1 |

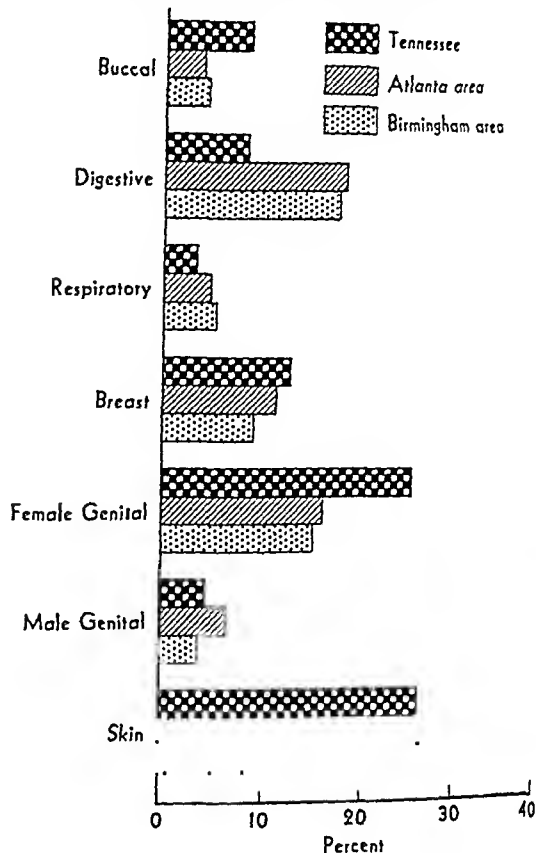
cancer of the so-called accessible sites while the broader groups of patients in Atlanta and Birmingham were seen for the inaccessible sites as well.

Extent of Lesions

It is of interest to know the percentage distribution of the patients admitted to the Tennessee clinics according to the extent of their lesions (table 3 and fig. 4). Of the 2,476 patients, 600 (24.2 percent) were stated to have localized lesions; 719 (29.0 percent) were stated to have regional involvement; and 435 (17.6 percent) were thought to have remote metastasis at the time of admission. The extent was not classified for 722 (29.2 percent) of the lesions. The following discussion of extent relates to the 1,754 patients for whom extent was stated.

As would be expected, cancer of the inaccessible sites was generally discovered late. Remote metastasis was more often present on admission for cancer of the digestive and respiratory systems than for any other site. The percentage of breast cancer with remote metastasis was relatively small, but more than 60 percent in both races had regional involvement. The distribution of cancer of the breast according to extent was the same for both white and Negro patients. This was also true for cancer of the female genital organs. For malignant neoplasms of the buccal cavity, di-

Figure 3. Percentage of cancer cases, by site, Tennessee tumor clinics, 1947-49, Atlanta, Ga., 1947, and Birmingham, Ala., 1948.



gestive organs, respiratory system, and male genital organs, the percentage with remote metastasis was somewhat greater for Negro than for white patients.

In only a small proportion was there remote metastasis of the skin lesions on admission. However, the proportion of Negroes with regional involvement was much larger than for white patients. More than three-fourths (78.8 percent) of the malignant neoplasms of the skin in white patients were localized compared with 40 percent in Negroes.

Since such a large percentage of the white patients had skin cancer and most of these lesions were localized, the data excluding skin sites are given in table 3 and figure 5. When skin cancer is excluded, the percentages of the lesions in each extent group are practically the same for the white and Negro patients. These percentages are as follows: Approximately 20 percent for each race were localized;

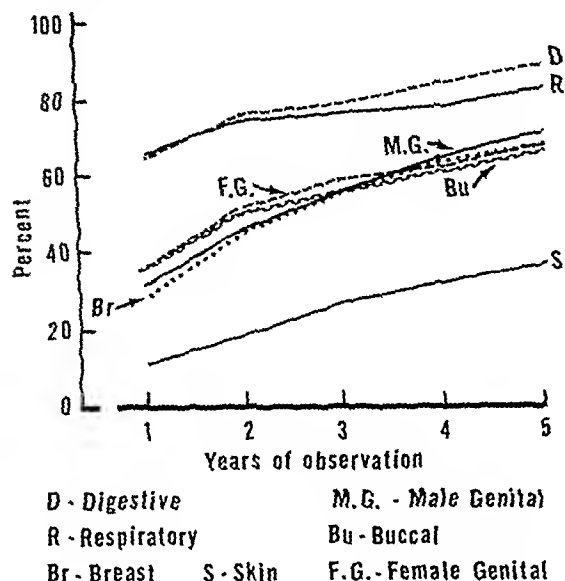
Table 2. Percentage of patients with malignant neoplasms, by site, participating clinics in Tennessee, 1947-49, Atlanta, Ga., area, 1947, and Birmingham, Ala., area, 1948

| Site | Tennessee | Atlanta ¹ | Birmingham ² |
|-----------------------|-----------|----------------------|-------------------------|
| Total | 99.9 | 100.0 | 99.9 |
| Buccal cavity | 8.0 | 3.7 | 4.1 |
| Digestive organs | 8.0 | 17.8 | 17.7 |
| Respiratory system | 3.3 | 4.7 | 5.2 |
| Breast | 12.5 | 10.3 | 9.0 |
| Female genital organs | 25.2 | 16.3 | 15.5 |
| Male genital organs | 4.2 | 5.9 | 3.8 |
| Skin | 26.3 | 26.0 | 26.7 |
| Other | 12.4 | 15.3 | 17.9 |

¹ SOURCE: Reference 1.

² SOURCE: Reference 2.

Figure 7. Mortality of cancer patients admitted to tumor clinics, by site, during 5 years of observation, Tennessee, 1947-49.



tality for sites other than digestive and respiratory systems was more gradual (table 4, fig. 7). When the cumulative percentages by years are shown graphically the lines for buccal cavity, breast, female genital organs, and male genital organs almost coincide. Approximately one-third of those with cancer of either of these four sites died during the first year of observation with the remainder of the deaths occurring during the next 4 years. The mortality of those with malignant skin neoplasms was much lower, with 10.8 percent dead within the first year and increasing until 30.6 percent had died by the end of the 5 years of observation. Figure 7 points out that mortality was highest for the inaccessible sites, next highest for the partially ac-

cessible sites, and lowest for the accessible site of skin.

How does extent of the lesion affect these rates? This can be seen for white and Negro patients in table 5 and figure 8. If remote metastasis was present at the time of clinic admission, the mortality was the same for the two groups; approximately three-fourths of all were dead at the end of the first year and by the end of 5 years more than 90 percent were dead. When there was regional involvement, approximately 30 percent of the white patients and 40 percent of the Negroes were dead by the end of the first year. Two-thirds (66.3 percent) of the white patients and three-fourths (76.2 percent) of the white patients and three-fourths (76.2

Figure 8. Mortality of cancer patients (excluding skin) admitted to tumor clinics by extent of lesion and race, during 5 years of observation, Tennessee, 1947-49.

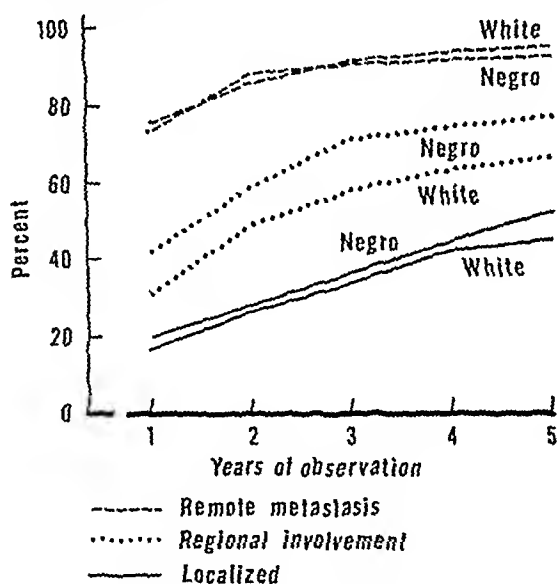
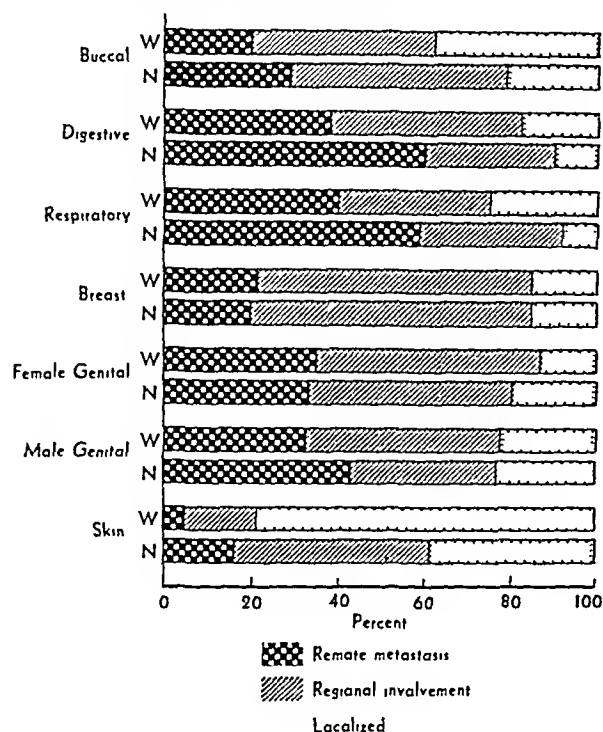


Table 5. Percentage of patients with malignant neoplasms of sites excluding skin dying during first 5 years of observation, by known extent and race, Tennessee tumor clinics

| Period of observation | Localized | | Regional involvement | | Remote metastasis | |
|-----------------------|-----------|-------|----------------------|-------|-------------------|-------|
| | White | Negro | White | Negro | White | Negro |
| First year | 16.0 | 20.0 | 31.1 | 40.8 | 75.7 | 74.2 |
| First 2 years | 26.6 | 27.9 | 47.9 | 58.5 | 86.2 | 87.7 |
| First 3 years | 33.4 | 36.0 | 57.6 | 68.9 | 90.8 | 90.0 |
| First 4 years | 41.2 | 43.6 | 62.6 | 73.1 | 94.1 | 91.8 |
| First 5 years | 45.1 | 51.1 | 66.3 | 76.2 | 94.6 | 92.4 |

Figure 4. Percentage of cancer cases admitted to tumor clinics, according to site, by race and extent, Tennessee, 1947-49.



tion. Each of the persons with unknown status is counted as being exposed to one-half year of experience since it is probable that some have died and others have survived. The status of 92.2 percent of 2,476 patients admitted to the clinics was known at the end of 5 years. Thus, 7.8 percent of the patients were lost because of unknown status.

Nearly two-thirds (62.4 percent) of all patients admitted were dead by the end of 5 years of observation. The percentages vary according to the site of the malignant neoplasm (table (4 and fig. 6).

The highest mortality followed cancer of the digestive organs, with 85.9 percent of the patients dead within the first 5 years. For the respiratory system, 80.9 percent of the patients died during the 5 years. Next in order were cancer of the male genital organs (69.5 percent dead), breast and female genital organs, with 66.5 percent of patients with cancer of each site dying, and cancer of the buccal cavity, for which the mortality was 65.4 percent. The probability of dying with cancer of the skin during the 5 years was only 36.6 percent.

How is the mortality for these sites distributed over the 5 years? Approximately two-thirds of those with cancer of the digestive organs or respiratory system died during the first year of observation. It may be remembered that a relatively large percentage of the patients with cancer of these two sites had remote metastasis on admission. As will be shown later, most of the patients with such extensive involvement died during the first year. For patients with cancer of the digestive organs and respiratory system, the percentage dying the first year was as high as the percentage at the end of 5 years for patients with cancer of the buccal cavity, breast, female genital organs, and male genital organs. The increase in mor-

Figure 5. Percentage of cancer cases (excluding skin) admitted to tumor clinics, by extent of lesion and race, Tennessee, 1947-49.

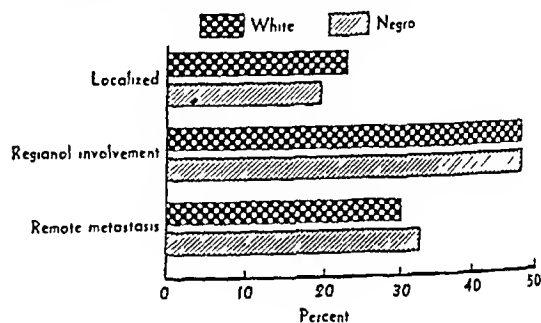
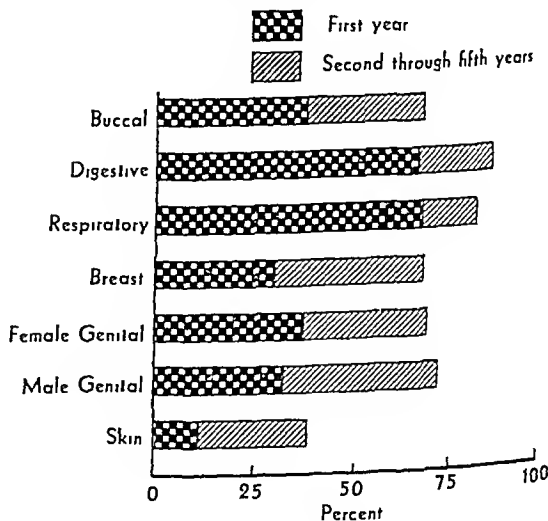


Figure 6. Mortality of cancer patients admitted to tumor clinics, by site and years of observation, Tennessee, 1947-49.



To feed homeless and displaced people following a disaster or a possible nuclear attack upon this country requires advance planning. Radioactivity from fallout might further complicate emergency feeding following a disaster.

Emergency Feeding

By ROY E. BUTLER, M.D.

THE LATEST assumptions of the Federal Civil Defense Administration envisage the possibility of attack with thermonuclear weapons on many major cities in this country. The destruction of cities which are critical target areas would preclude adaptation of civil defense methods used in Europe in limited and localized bombings of the Second World War.

At that time Britons found that a bombed out worker was helped to get on with the job if he had a cup of tea and cakes. On being notified of a bombing incident, the Queen's Messengers, staffed by members of the Women's Voluntary Service, proceeded to the site with food-equipped vans and carried out emergency feeding operations. The warm meals served to bolster morale. Cash with which to buy food or restaurant meals, an attempt to restore normal food channels, and the provision of a small amount of food without particular regard to nutrient content were the usual methods of feeding the homeless. Mass feeding usually was limited to a day or two.

The dislocation of populations surviving or anticipating urban disaster would necessitate mass feeding on a huge scale for protracted pe-

riods. Regions near critical target areas in this country might be deluged by displaced thousands to be fed and housed under relatively primitive conditions. The salvage of food from areas contaminated by radioactive dust or water would pose hazards that might be multiplied several times by the concomitant use of chemical and biological warfare agents. Sanitary water supply, sewage and waste disposal, and food preparation would be difficult to provide in such an event.

The handling of some of these problems is described in "Emergency Mass Feeding—Instructor Course," a publication developed by the Department of Defense and the Federal Civil Defense Administration (1).

Those feeding evacuees immediately after attack would have to improvise ways of preparing available food. The need to appease hunger would take priority over attempts to prevent disease, to vary diet for different age groups or conditions, or to balance the nutrient content of emergency menus. It may be impossible to satisfy traditional food patterns.

Federal and State Cooperation

Ever since its establishment in January 1951, the Federal Civil Defense Administration has been helping States prepare for a war emergency. In the event of a general attack, FCDA would direct all Federal activities concerned with the saving of life and the relief of suffer-

Dr. Butler is assistant chief of Health Emergency Planning in the Office of the Surgeon General, Public Health Service. This paper is based on a talk delivered October 12, 1956, at the annual meeting of the West Virginia State Nutrition Council, Keyser, W. Va.

percent) of the Negro patients were dead within 5 years after admission. As would be expected, mortality for those with localized lesions was lower for both the white and Negro patients.

What were the causes of death for those patients who died? The deaths were studied according to the cause of death as given on the death certificate. There were 1,497 deaths among the 2,476 patients admitted. The cause of death was definitely stated as cancer for nearly three-fourths (72.5 percent) of the deaths for both the white and Negro patients. It would be of interest to study these cancer deaths to see how many were caused by the same type of cancer that was diagnosed on admission and how many were due to another type. Perhaps this can be done in subsequent studies.

Summary

Followup data are available for 5 years for patients admitted to the participating cancer clinics in Tennessee in 1947, 1948, and 1949.

Of the 2,476 admissions to the clinics during these 3 years, approximately one-fourth were for cancer of the female genital organs and one-fourth for skin cancer. Of the white patients, 38.2 percent had skin cancer while only 2.9 percent of the Negro patients had skin cancer.

Thirty-three percent of the patients died during the first year; 46 percent were dead by the end of the second year; 54 percent, by the end of the third year; 59 percent, by the end of the fourth year; and 62 percent were dead by the end of the first 5 years of observation. The sites with the highest mortality were the diges-

tive organs and the respiratory system. The percentage dying with cancer of these sites during the first year was as high as the percentage at the end of 5 years for patients with cancer of the buccal cavity, breast, female genital organs, and male genital organs.

More than 90 percent of both white and Negro patients with remote metastasis at time of admission to the clinic died within the first 5 years. Two-thirds of the white patients and three-fourths of the Negro patients with regional involvement on admission were dead within 5 years. Mortality among those with localized lesions was lower for both white and Negro patients.

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Detailed data on the survival status of the clinic patients and the method used in calculating the probability of their survival or death can be obtained in mimeograph form from the author.

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Cardiovascular Disease Abstracts

A new publication devoted to abstracts in the cardiovascular disease field is being issued in 1957 by the Excerpta Medica Foundation with the support of the National Heart Institute, Public Health Service. The first volume, containing approximately 800 pages, will cover the world's medical literature.

Among subjects covered in separate chapters, in addition to the basic medical sciences, will be diseases of the pericardium, myocardium, and epicardium; rheumatic fever; congenital cardiovascular disease and pulmonary circulation; hypertension, peripheral vascular disease, hypothermia, artificial circulation, and special problems of the heart patient; and rehabilitation.

normally carried in the home, in the retail store, in wholesale houses, and in the processing plants. They are attempting to determine what percentage of the normal supply would probably be lost in a nuclear attack, in order to determine whether processed foodstuffs should be stockpiled to meet essential demands until food processing can again fill the demand. I feel confident that if their studies reveal serious shortages of particular foodstuffs, they will recommend that adequate stockpiles be formed.

"In this regard the Federal Civil Defense Administration has recommended that all households have a 7-day supply of food on hand."

Nutrition Planning

Although local distribution of food and emergency feeding operations are a welfare responsibility, it is expected that the health organization will supervise sanitation procedures relating to emergency food preparation and waste disposal. In addition, FCDA in the manual entitled "United States Civil Defense—Health Services and Special Weapons Defense" has recommended specific responsibilities for the health services in the field of nutrition (3).

The health and welfare services must cooperate in providing a nutritionally adequate supply of food for emergency feeding. To achieve this purpose, the welfare service should have a qualified nutritionist on its staff, the health department should include a nutrition service, and each program should be fully informed of the other's progress. The nutrition program of the health department should be directed by a qualified medical nutritionist who will advise on the suitability of the dietary planned for the local population.

With food shortages and conflict of needs and priorities, wise allocation of food supplies will be part of the price of survival.

How many calories must be supplied each individual cannot be specified. That will depend on the supplies of food and the activities and size of the population, but the supply should support life, the capacity to work, and morale. Periodic physical surveys of the population may be necessary to determine nutritional status and to justify and guide rationing policies.

Various recommendations have been made to guide families as to maintaining standby food supplies for emergency use. It has been assumed that households ordinarily would have 2 or 3 days' supply of food on hand.

The Federal Civil Defense Administration recommended a 7-day supply for the individual home after it became apparent in 1954 that thermonuclear weapons would produce considerable fallout. Dangerous radioactivity after an attack will keep people inside shelter for 7 to 10 days or more. When surviving homes are opened to shelter the homeless, the supply of food and water also will have to accommodate additional numbers.

In the preparation and distribution of food for large groups, observance of good sanitation practices will be difficult under emergency conditions. New or unfamiliar strains of bacteria may lead to outbreaks of diarrheal disease. Families may resist attempts at separation, and not merely because they like to eat together or because they are accustomed to their own ways of cooking and seasoning.

If mass feeding is necessary for only a few days, the problems cited will be relatively unimportant, but with extended periods of feeding homeless populations, for weeks or months, the problems may lead to trouble if not a complete breakdown of the operation. The prospect of feeding thousands or millions of homeless families emphasizes the value of adequate planning and efficient organization to proceed with any semblance of order.

Belsen Experience

Emergency feeding for the extremely malnourished or starving should receive some comment.

The use of protein hydrolysates to rehabilitate starving prisoners after the surrender of Germany in World War II has evoked considerable interest. Protein hydrolysates are mixtures of amino acids prepared by splitting a protein with acid, alkali, or enzyme. Several organizations in this country produced these substances for oral and intravenous use.

I well remember a news conference in London in May 1945, at which a British nutritionist



Salvation Army canteen provides ample helpings of cold ham and hot lima beans to the hungry and homeless during a flood disaster.

ing. Some States and local communities have their own programs for training civil defense workers. Each should have a plan for stockpiling food and medical supplies.

FCDA has placed responsibility for emergency feeding in its Welfare Office. This organizational pattern has been repeated in State civil defense organizations, where similar responsibility is centered in the welfare and public assistance programs. However, by FCDA-delegated authority, the Department of Agriculture has Federal responsibility for maintaining adequate emergency food supplies for target and support areas.

In discussing the problem of food supply in a national emergency, Federal Civil Defense Administrator Val Peterson made the follow-

ing statement to the House Agriculture Committee on March 7, 1956 (2):

"In the first phase of an emergency, the problem may be less one of the reserve stocks of food than one of distribution.

"After the first few days or weeks of an attack, however, when processed food stocks have been depleted, then raw materials must be processed and placed in the distribution system.

"The question of how quickly the processed foods will be used up will, of course, depend upon the number of persons surviving to consume the food, the total amount of food, and the availability of transportation to distribute the food where it is needed.

"The Department of Agriculture is studying the problem of the amount of processed food

fense have been appropriated to the department, nor are there any budgetary provisions whereby additional personnel can be employed for the purpose.

According to the plan, the State director of public assistance will function as the civil defense chief for the division of welfare and will designate the department's nine administrative districts as areas in the civil defense program. One of the larger cities or towns is the headquarters and center of operation. The districts cover 55 counties.

In each area, the present district administrator of the department is the area chief for his district, and in each county, the county director is the county chief.

The department's workers, in their respective counties, will coordinate welfare needs with the county courts, county enforcement authorities, and the Community Chest, Salvation Army, Red Cross, and other voluntary agencies. All will function under the command of the county director for civil defense.

In the last few paragraphs, I have paraphrased portions of the annual report of the West Virginia State Department of Public Assistance for the fiscal period July 1, 1954, to June 30, 1955 (4). Now to quote directly:

"Fortunately the department of public assistance in West Virginia operates a division known as the Division of Commodity Distribution. Its program requires warehouses, the use of sidings, and trucks throughout the State. The department plans to develop that division, from that nucleus, into a wide range of volunteer services with trucks, cars, or whatever else is required in bombing emergencies to operate from the various sidings or warehouses which have been set up for the purpose of delivering foods and any other government-donated materials to the points of disaster."

In addition, I might add, the West Virginia Division of Commodity Distribution will have the responsibility of procuring food and goods from neighboring States. Formal agreements for the purpose have been negotiated by the West Virginia Department of Civil Defense.

The report (4) of the division of commodity distribution for the fiscal year 1955 indicates the magnitude of its normal operations. Dur-

ing the year the division provided commodities to 250,000 public assistance clients, served 11,961 persons in 84 State and private institutions, 13,209 children in summer camps, and 163,064 children through the school lunch program. Under disaster relief 2,500 persons received food.

The figures in the following list illustrate 7 different food items from a group of 19 distributed by the division in varying amounts over the same year (4). This is a partial indication of the experience one State department of public assistance has had in warehousing and distributing foods and of its ability to carry on this mission in a national emergency.

| | <i>Pounds</i> |
|-----------------------------|---------------|
| Beans, dried..... | 6, 836, 800 |
| Beef and gravy, canned..... | 760, 005 |
| Butter, processed..... | 3, 637, 904 |
| Cheese, processed..... | 5, 822, 810 |
| Milk, dried, processed..... | 4, 790, 014 |
| Rice, milled..... | 6, 046, 900 |
| Shortening..... | 4, 353, 768 |
| Total..... | 32, 248, 001 |

NRC Suggestions

Immediately bearing on this whole problem and summarizing the essential elements of emergency feeding is a statement of the Food and Nutrition Board, National Research Council. The statement was published in 1951 (5):

"The Committee on Dietary Allowances has been requested to make suggestions which may assist State and local civil defense organizations in formulating plans for emergency feeding. The committee feels that certain general principles should govern all such plans. Of paramount importance is the inclusion of personnel with broad training and experience in nutrition in civil defense organizations at the highest administrative level. The efficacy of any feeding program during a period of disaster will be dependent on integration and collaboration with other essential services.

"In the event of enemy attack on this country, immediate and severe disruption of food supplies in the affected area may ensue. The initial problem will be one of supplying water and of distributing whatever foods may be available. It is unrealistic to expect to provide an



A classroom in a school, serving as an emergency relief center, is used for storing food and other supplies distributed to flood victims.

described his experience at Belsen after liberation of the concentration camp.

The prisoners fought madly against attempts to administer intravenous injections of protein hydrolysate material because they were convinced that the needles contained gasoline, infections agents, or other toxic substances. They strongly resisted all efforts to make them take the protein compound by mouth. Forced feeding in quantities to meet metabolic requirements was similarly unsuccessful. Much more success was achieved with milk, eggs, sugar, and other familiar articles of food.

We cannot expect starving people to be rational.

Under the circumstances related, prisoners of professional status, physicians and nurses included, could not be entrusted with the care and feeding of other prisoners. Apparently their harrowing experiences and physical and mental condition affected their ethical and professional standards.

We hope that never again will such a degree of malnutrition be encountered.

Voluntary Agency Feeding Programs

The value of adequate planning and organization has long been recognized by the American National Red Cross, which has had ex-

tensive experience with meeting the emergency needs of disaster victims. Each local chapter has a food committee whose members are selected from dietitians, nutritionists, home economists, wholesale grocers, and managers of school lunchrooms, restaurants, and hotels.

An agreement, dated February 6, 1953, between the Red Cross and the Federal Civil Defense Administration provides for cooperative assistance in disasters other than those induced by enemy attack. Undoubtedly, to relieve a national disaster, the Red Cross would contribute to the full extent of its capacity. Likewise, the experience of the Salvation Army and the school lunch groups with mass feeding will surely be applied.

West Virginia Program

A good example of planning and organization by a State is found in West Virginia.

The civil defense program of West Virginia features the assignment of separate disaster functions to each of the State departments. The welfare functions of civil defense are centered in the West Virginia State Department of Public Assistance. Emergency welfare services are defined in the State plan as feeding kitchens, reception centers, and registration of disaster victims. No funds for civil de-

Community Surveys Yield New Services For the Chronically Ill

By ELEANOR L. RICHIE, M.A.,
and J. E. CANNON, M.D., M.P.H.

COMMUNITY INTEREST in the problems and service needs of the chronically ill and the aged has been increased in four Colorado counties in recent years by locally developed programs of household surveys and studies of nursing homes and other health facilities. The county programs received general guidance and financial assistance from the Colorado State Department of Public Health under a gerontology grant from the W. K. Kellogg Foundation from June 1953 through December 1956.

The participating counties were El Paso, Mesa, Otero, and Weld. In each, there is an organized local health department, either a college or a junior college, and numerous civic, professional, business, and community service organizations. Through such agencies and groups, new steering and executive committees were formed to plan the studies of the chronically ill and the aged. Subcommittees and voluntary workers assisted in carrying out the surveys. Community organization for the programs centered in the principal cities, but the household surveys and nursing home studies were countywide. Population coverage in the household surveys averaged 50 percent or better.

El Paso County has a population of about 115,000, including some 30,000 military personnel stationed in or near Colorado Springs, the county seat. The city, situated at the foot of Pike's Peak, is the financial, trading, cultural, and residential center of a mining, agricultural, small industry, and tourist trade area. Mesa County, on the western slope of the Rocky

Mountains, is a fruit-growing, livestock-raising, and mining area of about 50,000 population, including Grand Junction, the county seat, with about 30,000 population. Otero and Weld Counties, on the plains east of the mountains, are occupied with agriculture and related industries. They have populations of about 30,000 and 75,000, respectively. The principal cities are La Junta and Greeley, which have about 10,000 and 25,000 inhabitants.

Desire for Action

In the four counties, a full-scale viewing of the interrelated problems of the chronically ill and the aged was afforded the committees for the studies, the many volunteer canvassers in the household surveys, and the smaller groups who surveyed nursing homes and other facilities. Heartfelt interest created by this personalized experience brought demand for action and immediately led to new community services. It stimulated plans for more comprehensive supplementation or reorganization of existing services in the future.

Lasting results of the study program cannot be fully assessed at this early date. Nevertheless, new activities and plans reported to date indicate that numerous postsurvey recommendations made by the study committees are now being implemented.

New Starts and Future Goals

In El Paso County, the foremost recommendation based on the community studies was that programs and services for the chronically ill and the aged be better integrated. As a start toward the needed coordination, a health referral center has been set up with community support, resources, and personnel and with technical and financial assistance from the State department of public health. In addition, a special committee of the county medical society is studying ways to integrate the numerous clinic services in Colorado Springs and to provide more adequate medical care to the indigent and medically indigent of the county, through medical society panels or similar methods instead of the county physician system used in the past. Need for a central rehabilitation serv-

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adequate diet or to designate specific nutrient requirements for this emergency period for any large population. Food to supply energy needs, preferably from bread, soups, or stews, should suffice for the first few days. As soon as possible, milk, including skim milk powder or evaporated milk should be provided, particularly to pregnant or lactating women, and to children from infancy through adolescence. Foods such as those mentioned above, in contrast to highly refined products, will furnish protein and other essential nutrients as well as energy. It should also be emphasized that a hot beverage, regardless of its nutrient content, is highly desirable early in an emergency feeding period.

"For infants, special plans should be made to assure maintenance of adequate supplies of canned evaporated milk, dry milk powder, cereals, and water for emergency feeding.

"It should be appreciated that drastic reduction of food intake for a few days, or even weeks, is tolerated reasonably well except by infants, by lactating women, by the sick and injured, and by those engaged in heavy physical work. This is particularly true if the calories that are available come largely from foods that furnish a variety of nutrients such as bread, potatoes, and milk, in contrast to foods such as sugar, sirups, and oils, which supply calories primarily. In longer periods of food shortage, special provision should be made not only for the more vulnerable groups indicated above but also for women who are pregnant.

"If emergency feeding must be continued for more than a few weeks, the problem of individual nutrients, as well as calories, assumes importance. Cognizance must be taken of needs for protein, thiamine, other B-complex vitamins, and ascorbic acid. Deficiencies of minerals and fat soluble vitamins are not likely to occur unless food shortages have persisted over several months.

"In any prolonged emergency, nutritional appraisal of the population by trained survey teams should be an integral part of the program. In this way, any deleterious effect of

the food allowance on health can be determined and plans for correction instituted.

"Care should be taken not to waste food due to possible contamination by atomic radiation. Food present in closed containers is safe in nearly all cases, if the outside of the container is washed. Food in open or broken containers exposed to radioactive materials should be monitored before use."

Conclusion

Adequate preparation for an emergency requires the development of an effective organization of competent people who are familiar with the problems to be expected and the best possible solutions for them. The emergency feeding personnel should be familiar with the responsibilities of the other civil defense services such as transportation, communications, supply, fire, and police. Adequate stocks of the proper foods would be helpful but cannot be anticipated. Improvisation and substitution would be the order of the day, and all efforts should be pointed toward existence and survival and the successful defense of the country.

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Minor Venereal Diseases In the United States

By HENRY PACKER, M.D., Dr.P.H.

CHANCROID, lymphogranuloma venereum, and granuloma inguinale, the so-called minor venereal diseases, have declined markedly in the United States during the past 10 years.

This downward trend for the period 1946-55, depicted in the chart, is based on the number of cases of each of the minor venereal diseases reported to health departments in the continental United States. Reported cases of primary and secondary syphilis are included as a basis for comparing the rate of decline of the other venereal diseases.

Although the decline rates of the minor venereal diseases are of lesser magnitude than the 94 percent for primary and secondary syphilis, they are quite impressive.

The 10-year period subsequent to 1945 provides a reasonably uniform population upon which to base a trend. The number of civilian cases reported prior to this period was affected by the large proportion of young adults in the military services.

In probing the factors that may have contributed to the decline, consideration will be given to diagnostic procedures, contact investigation, and specific therapy of cases and contacts. Opinions regarding control procedures which may have influenced the trend were obtained from questionnaires submitted to venereal disease control officers in the 10 States from which the greatest numbers of cases were reported during the 1946-55 period.

Chancroid

Chancroid, the most prevalent of the minor venereal diseases during the decade under consideration, declined 68 percent. However, the use of definitive bacteriological methods for the

diagnosis of chancroid has been the exception rather than the rule in most clinics in this country, and this diagnosis usually represents a clinical impression reached after excluding syphilis. The designation of chancroid may therefore be considered as a convenient wastebasket category for nonsyphilitic ulcerative lesions of the genitalia.

At least one study of ulcerative genital lesions occurring in epidemic form among American soldiers in Japan has indicated that organisms other than *Haemophilus ducreyi* are capable of producing lesions of the genitalia resembling chancroid (1). Japanese workers (2) have reported that organisms bearing a morphologic resemblance to *H. ducreyi* were commonly found in prostitutes and that these could be easily mistaken for *H. ducreyi* with which they have no immunological relationship.

As mentioned above bacteriological methods are infrequently employed in the diagnosis of chancroid although their superiority to clinical criteria has been demonstrated repeatedly. Studies during the past decade in this country confirm earlier reports that smears may be expected to detect approximately 50 percent of infections, while cultures, the diagnostic procedure of choice, will identify 75 percent or more (3, 4). Although the skin test is positive in approximately 70 percent of cases, the limited sensitivity of this test during the early stages of infection and the persistence of a positive reaction after recovery make the skin test of limited value in early diagnosis. For this reason, it is presently used only to a limited extent in venereal disease clinics in this country.

There are no reports in the recent literature indicating that contact investigation has either been widely applied or has achieved any degree of success in controlling this disease. Our own experience in identifying sources of chancroid infection has been disappointing. Female sexual contacts of our male patients generally reveal neither genital lesions nor organisms resembling *H. ducreyi*. Reasons for this situation are not clear. In spite of the reduced incidence of chancroid we still lack basic information regarding the natural history of this disease. The comparatively rare observation of clinical manifestations of this disease in the

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ice was made clear by the community studies, and there is strong desire to build such a center. Much of the planning and sponsorship for a center can be done by community groups with the assistance of the executive secretary of the health referral center, but considerable technical assistance from such agencies as the State and Federal public health services will be needed. Shortly after the community surveys had highlighted rehabilitation and occupational needs of the handicapped, a clinic providing services only for convalescents from a specific illness broadened its program to general convalescent rehabilitation. Also as a result of the surveys, the Goodwill Industries accepted an invitation to operate in Colorado Springs.

In harmony with survey recommendations in Otero County, one of the hospitals established a chronic disease unit and is now interested in expanding that unit. Also, a chronic disease clinic is under development, and there is growing interest in coordination of clinic, home care, and hospital service programs for the chronically ill by the local health department and the hospitals. During or soon after the community studies were begun, news stories reported concerts by a group of "oldster" musicians, fund raising to establish a recreation center for the senior citizens, and entertainments to raise money for television sets and other recreational needs of patients in the new chronic disease unit of the hospital.

Concrete recommendations based on the community studies in Mesa County included these: organization of a rehabilitation service by the medical society, nursing home operators, public health groups, and other interested agencies; medical society, public health department, and public welfare department cooperation in a screening service for placing elderly persons requiring care outside of their own homes; and establishment of a registry of handicapped per-

sons needing assistance of various kinds. The report on the survey of nursing homes recommended finer distinction in definitions of nursing homes, boarding homes, and homes for the aged; appropriate standards for each type of home; more room space and greater privacy in the homes; and better understanding of rehabilitation and recreational needs of persons in the homes. Representative groups have continued their interest in organizing a pilot project to show how a centralized nonsectarian, non-governmental agency guided by a council of professional volunteers can help families solve domestic difficulties before they become major crises. If the project can be financed, special attention will be given during the demonstration period to problems of elderly and chronically ill family members.

In Weld County the community surveys gave impetus to formation of a new adult education class; legislative proposals for a school for the handicapped; new church programs for the chronically ill and the aged; and submission of proposals to the community building committee for a center for the aged in Greeley. Plans for establishing homemaker and home nursing services for the chronically ill and the aged of the county which were proposed at the time of the community surveys are again receiving active sponsorship.

Financial Aid and Technical Guidance

In the long run, the new services and the new ways of providing services which were recommended as a result of the community studies probably will not be beyond the financial means and personnel resources of localities. At present, however, the indications are that some financial aid and considerable technical guidance is needed to implement the recommendations more fully while community interest still is high.

infectious by therapy have played a role in the decline of lymphogranuloma venereum, although this factor cannot be disregarded, since isolation of the infectious agent from tissue does not necessarily indicate infectiousness.

Satisfactory clinical response to therapy is readily achieved by administration of the sulfonamide drugs, chloramphenicol, or the tetracycline antibiotics. Due to the greater cost of the tetracycline antibiotics, the sulfonamide drugs are widely employed in public clinics, and there is no evidence that they are inferior to the tetracycline antibiotics. Both forms of medication have been increasingly employed for the treatment of the anorectal syndrome (12) with gratifying results, frequently making drastic surgical procedures unnecessary.

Granuloma Inguinale

The decline of 78 percent in granuloma inguinale during the past decade is of considerable magnitude. As with chancroid and lymphogranuloma venereum, credit for this decline cannot be given to efforts to identify sources of infection and to administer specific therapy to them. Granuloma inguinale is rarely encountered in sexual contacts, in spite of the chronic nature of the ulcerative lesions and the continued presence of the etiological agent, *Donovania granulomatis*, in the lesions. This suggests a low degree of communicability.

The question has been frequently raised as to whether granuloma inguinale is truly a venereal disease. In spite of its equal distribution between the sexes, there is little epidemiological evidence of its venereal transmission. The possibility that granuloma inguinale represents an autoinfection from a fecal organism has been postulated from time to time (13, 14) and must be considered as a possible explanation of the origin of the disease, at least until better evidence of its sexual transmission is forthcoming.

Diagnosis of granuloma inguinale by demonstrating *D. granulomatis* in smears is a simple procedure. A high degree of success follows therapy with streptomycin, chloramphenicol, or the tetracycline antibiotics. Of interest is the increasing number of reports of granuloma inguinale of the cervix which have appeared in the recent literature (15, 16). This

condition is frequently mistaken for carcinoma, but it has a far better prognosis and responds readily to specific therapy.

Discussion

The downward trend in the minor venereal diseases, chancroid, lymphogranuloma venereum, and granuloma inguinale, during the past decade has been gratifying. It is hoped that this is not a false picture created by the reduction of case-finding programs following the curtailment of funds for venereal disease control during the period 1946-55. If the decline can be assumed to be a real one, it cannot be attributed to vigorous efforts to identify and treat sources of infection since such measures have been the exception rather than the rule. The venereal disease control officers questioned, as well as the writer, are of the opinion that the following factors have contributed to the improved picture:

1. Widespread use of sulfonamide drugs and antibiotics for other diseases may have reduced the reservoir of latent infectious cases of the minor venereal diseases.
2. Improved personal hygiene practices following exposure to infection may have resulted from the educational efforts of the Armed Forces during World War II.
3. Improved socioeconomic circumstances in this country during the past decade may have influenced predisposing factors, such as family breakdown and prostitution.
4. A successful attack has been waged against organized prostitution, which undoubtedly helped to propagate these diseases.

Notwithstanding this improved situation, there are still many gaps in our knowledge of the natural history of the minor venereal diseases.

Summary

The downward trend of the minor venereal diseases, chancroid, lymphogranuloma venereum, and granuloma inguinale, during the decade 1946-55 has been of considerable magnitude although less than that of primary and secondary syphilis. The sharper decline of the latter may reflect more complete epidemiological knowledge, more intensive efforts in contact

female remains to be explained and suggests that it exists in a latent form that is capable of inciting active clinical disease when transmitted to the male. This possibility is further suggested by the report that approximately one-third of Negro hospital patients over 25 years of age had positive skin reactions although most of them denied ever having had ulcerative genital lesions (5). This finding is confirmed by our own experience.

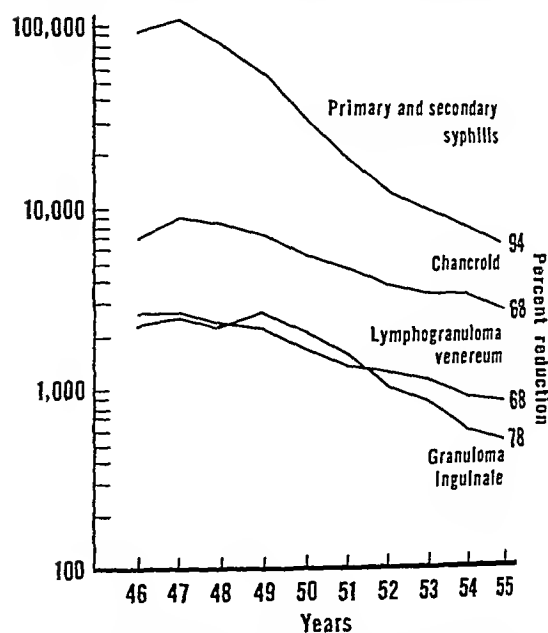
Chemotherapy, employing the sulfonamides, streptomycin, chloramphenicol, or the tetracycline antibiotics, has made the treatment of this disease simple and effective. Failure to respond to such medication should result in questioning of the diagnosis. The sulfonamide drugs and streptomycin are more widely used in view of their lower cost and lack of a tendency to mask a syphilitic infection.

Lymphogranuloma Venereum

The decline of 68 percent in the incidence of lymphogranuloma venereum during the last decade may be considered somewhat remarkable in view of the fact that, as for chancroid, identification of sources of infection has not been a routine practice in most clinics. Furthermore, doubt exists as to whether infectiousness is controlled by therapy, no matter how effective the therapy may be in resolving signs of the disease.

The diagnosis and management of lymphogranuloma venereum are handicapped by the difficulty of identifying the etiological agent by ordinary procedures and by the limitations of the Frei test and the complement fixation test in differentiating past from present infection. According to reports from a number of American cities, Frei tests performed upon adult Negro patients in the wards of general hospitals were positive for 40 to 50 percent (6). The proportion showing positive complement fixation tests is even higher (7), suggesting that the complement fixation test is less specific than the Frei test. Also, a number of workers have reported a lack of correlation between these two tests (8, 9). A high percentage of patients who are positive to both tests deny ever having had any of the typical clinical manifestations of lymphogranuloma venereum.

Trend in number of reported cases of primary and secondary syphilis and the minor venereal diseases, continental United States, 1946-55.



NOTE: Percentage reduction by 1955 derived from the highest figures during the first half of the decade. Basic data from VD Fact Sheet, PHS Pub. No. 341, December 1955, table 5, p. 9.

This suggests that subclinical infection is extremely common and that it probably has constituted a reservoir of infection. Under these conditions, the Frei test and the complement fixation test are of little value in tracing sources of infection. If the decline in reported cases of lymphogranuloma venereum is also reflected in a lower prevalence of positive skin tests and complement fixation tests, these tests may prove to be of greater value in the future in identifying sources of infection.

Another reason for the limited attempts to identify sources of infection of known cases of lymphogranuloma venereum is the uncertainty that specific chemotherapy can make such persons noninfectious (8). Results of a number of studies designed to determine whether the etiological agent of the disease can be isolated from experimental animals or humans subsequent to specific chemotherapy raise considerable doubt that eradication of organisms is achieved with regimens of therapy now in use (10, 11). This leads one to wonder whether factors other than the making of patients non-

AIR POLLUTION

research seminar

On December 18, 1956, in Cincinnati, the Public Health Service convened a national body of investigators in a 3-day seminar for planning research in the causes, effects, and control of air pollution.

Reports of four of the committees of that seminar are presented below in slightly revised form for the information of many who are interested in this work. Reports of the Medical Committee are to be published at a later date. This committee considered mainly the current toxicological studies related to air pollution.

Agricultural Committee

J. T. MIDDLETON, chairman

Air pollution significantly affects the agricultural economy of the country causing damage to animals and vegetation. Many plants respond to a concentration of air pollutants below that usually causing effects in animals, with notable exceptions such as carbon monoxide and hydrogen sulfide. Plants, therefore, may be useful indicators for the detection of air pollutants. The environment and genetic composition determine in large measure the influence of airborne toxicants to such an extent that, at present, it is difficult to prescribe allowable exposure to injurious materials.

The most important air pollutants affecting agriculture requiring additional research are the fluorine-containing compounds. The effect of compounds of bromine, chlorine, and iodine

are recognized, but they are not of immediate practical importance.

Perhaps next in importance are the oxidants, such as ozone, nitrogen oxides, and oxidized organic materials acting as a complex, which are believed responsible for smog damage to plants.

Ethylene and perhaps other low-weight, unsaturated hydrocarbons are believed to produce adverse effects on a variety of agricultural crops, including flowers and other ornamentals.

Miscellaneous organic materials as represented by aromatic complexes and phenolic compounds may have adverse effects on plants and require study.

Sulfur dioxide has long been recognized as an airborne contaminant responsible for specific injury to vegetation, and has been more extensively investigated than any other air pollutant.

Other airborne contaminants include the heavy metals such as mercury, lead, arsenic, and selenium as well as miscellaneous materials

investigation, and more effective therapeutic weapons. This is the consensus of venereal disease control officers questioned regarding the factors believed to play a role in the decline of the minor venereal diseases.

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Clearinghouse for Poison Control Centers

A national clearinghouse for poison control centers has been set up by the Public Health Service in line with requests for such services by the American Academy of Pediatrics and the American Public Health Association. A part of the Accident Prevention Program of the Division of Special Services, the clearinghouse will achieve limited operation by midsummer, providing consultative services and case analyses.

Full operations of the new service will include interchanging information among local control centers; stimulating prevention and treatment of poison cases; encouraging research; aiding in the establishment of poison control centers; studying trends in poisoning accidents; and acting as a repository of information.

Staff for the clearinghouse will include a pediatrician, a doctor of pharmacy or a pharmacologist, and an educational specialist.

Other organic compounds such as those found in the aromatic complexes have been implicated in certain instances of damage to vegetation but insufficient information is available to determine the exact nature of the material and its biological effect. It is presumed that a variety of miscellaneous organic materials might likewise be incorporated in this research area, such as growth regulators, fungicides, insecticides, and other agricultural chemicals.

Although mercury has a low vapor pressure, it has been known for some time to be an air pollutant, responsible for plant injury in enclosed spaces. The recent introduction of mercurial paints for use in greenhouses has renewed interest in this problem and emphasizes the need for a reevaluation of this toxicant. Similarly other elements including heavy metals are known to produce adverse biological effects; among these are arsenic, cadmium, lead, and selenium which in the past have been known to occur as air pollutants and should be reviewed periodically and kept in mind as air contaminants of possible importance to agriculture.

Other known air pollutants exemplified by hydrogen sulfide, mercaptans, ammonia, nitric acid, and carbon monoxide, while toxic to plants and animals, are not considered of importance to agriculture except under conditions of gross accidental discharge to the atmosphere.

Though they are recognized as important, this report does not include consideration of radioactive materials.

The air pollution research program in agriculture requires assistance and cooperation of chemical groups in developing needed analytical techniques, engineers for developing corrective and protective devices as well as air handling facilities for specific fumigation studies, meteorologists for assistance in understanding air contaminant dispersion patterns, and medical groups in developing and evaluating bioassay systems for identification and distribution of air pollutants.

The U. S. Department of Agriculture should augment funds available to existing research facilities and management services so that they may actively study from basic and applied points of view the factors affecting the occurrence and result of air pollution upon agriculture. The U. S. Department of Agriculture

with the Public Health Service should support liaison with private, industrial, and public research organizations.

The suggested research needs fall within the disciplines and competence of a large number of existing research organizations and they should be supported and encouraged to attack these problems.

Chemical, Aerosol, and Instrumentation Committee

LEWIS H. ROGERS, chairman

The projects listed below represent the combined efforts of some 30 scientists assembled to outline research areas and projects in the aerosol, chemical, and instrumental field which, in their opinion, require additional research. Taking cognizance of existing projects, the Chemical, Aerosol, and Instrumentation Committee attempted to develop projects not now being carried on. The order of presentation of projects is by subject matter and should not be taken to imply relative ranking according to importance. The group feels that sampling and analyses are such essential tools in all phases of air pollution that work in this field is needed before other problems can be attacked. Specifically, methods must be developed with precisely known accuracies, reproducibilities, and freedom from interference.

It is further recognized that an early start must be made in the study of certain basic problems because of the length of time required for their solution. During the discussions, it became apparent that one of the great needs of the field is for breakthroughs which fundamental research fosters.

In the following list short-, medium-, and long-range projects are designated by the letters S, M, and L, respectively.

Aerosols

Formation of Aerosols

Mechanism of smoke and fume formation including methods of modification (M).

Formation of aerosols during photolysis of polluted atmospheres (M).

Application of the particle-size spectrometer to nucleation studies (S).

Relationship of the composition of aerosols

such as hydrogen sulfide, mercaptans, ammonia, and carbon monoxide.

A description of some of the principal research needs follows.

Research on the effects of fluorides upon plants and animals has shown the gross symptoms resulting from the accumulation of fluorine-containing compounds in animals and plants.

A specific need exists for a study of the mechanism of toxicity and ultimate fate of diverse fluorine-containing compounds in both animals and plants. Both chronic and acute effects of fluoride accumulation are recognized. Particular attention should be paid to studies emphasizing the effect on agriculture of realistic concentrations of fluoride such as those found in industrial areas. Such studies should include the role of fluorides in skeletal development and organ function both for laboratory and farm animals. The effects of fluorides on cellular constituents, uptake, and translocation of fluorides, fate of fluorides in cells, and the nature of resistance and susceptibility in plant material are needed to elucidate the mechanism of action of this important pollutant.

An important area of research also needing attention is the effect of fluorides upon structure and physiological function in animals and plants. Such studies should elucidate the influence of fluorides on assimilation, digestion, and metabolism of the essential nutrients, as well as their effect on lactation, reproduction, and other vital processes in animals. Related studies in plants are required to determine the effect of fluorides on the assimilation and utilization of nutrients, photosynthetic activity, respiration, and enzyme systems, as well as growth and yield. It is also necessary that the degree of foliar necrosis, fluoride content of tissue, and rate of fluoride uptake be related to possible economic plant damage.

Environment and genetic composition materially affect the manifestation of fluoride accumulation in animals and plants. Factors which may affect fluoride toxicity in animals are different levels of nutrition, the presence of other toxicants and diseases, stage of development, pregnancy, and lactation. The response of plants to fluorides under different environments, including varied climatic condi-

tions, fertility, and water relations, requires investigation.

Some study should be made of the alleviation of fluoride effects in animals through management practices and therapeutic treatment.

Protective measures may be developed to reduce the effect of fluorides to sensitive plants.

Although methods for fluorine analysis in plant tissue are reasonably satisfactory at present, analytical methods for fluorides in air and animal tissue are somewhat less satisfactory and require further study.

Research on the influence of sulfur dioxide has been energetically pursued for the past 75 years. The results of these studies have resolved most of the problems affecting agriculture. Those that remain include the effect of sulfuric acid, aerosols, and sulfur dioxide on animals as well as the mechanism of their toxicity singly, together, and in combination with other contaminants.

Oxidants have been recognized as plant damaging agents for more than a decade in certain urban areas, notably in Los Angeles. Although some of the oxidants have been identified as ozone and nitrogen oxides, the agents responsible for most of the injuries to vegetation remain unknown though they are believed to be oxidized organics arising from photochemical reactions in the atmosphere.

There is a real need to develop analytical methods for the identification and determination of oxidants, and to determine the mode of action of the toxicants and their effect on metabolism and growth of plants and possible effects on animals. The gross manifestations of oxidants on plants are generally known.

Organic materials comprise a group of contaminants which have adverse effects upon plants and possibly animals. Ethylene and perhaps other low-weight, unsaturated hydrocarbons may be intimately associated with significant economic damage to orchids, floricultural and ornamental plants, as well as a variety of other agricultural crops. It is believed that ethylene is damaging to some plants at concentrations in parts per billion range, while no effect is recognized in animals at this concentration. A critical need exists for analytical techniques suitable for the detection and monitoring of ethylene and related materials.

for concentrations involved in work with odorants; for example, ultra long path infrared techniques (S).

Interaction of Gases and Aerosols

Photochemistry of organic and inorganic aerosols (M).

Heterogeneous reactions on surfaces (L).

The measurement of adsorption isotherms of pollutants (L).

Determination of the nature of the interaction of adsorbed species with the surface (M).

Meteorology Committee

E. WENDELL HEWSON, chairman

Our assessment of the present status of research on the meteorological aspects of air pollution indicates that progress on a wide front is being made. While very little overemphasis is noted, large areas of underemphasis are apparent.

Although the Meteorology Committee recognizes that it is not fully representative of all meteorologists working in the field, it nevertheless believes that the program of research which follows does outline in broad terms the general avenues along which further progress must be made. To pursue fully any of the particular subjects for research given here might require a number of research projects. We have deliberately kept the statement of each subject general in nature in order not to circumscribe unduly the necessary scope of possible effort. We have with equal deliberation avoided specific recommendations concerning advanced techniques of data transmission, data processing, and so forth, under the assumption that appropriate tools will be used in each case.

The committee recognizes that its recommendations undoubtedly will overlap some of those presented by other committees at this seminar; also, that the solution of many air pollution problems will require the cooperative effort of several groups. Perhaps a Gordon-type conference would be desirable to further the coordination of effort among the several disciplines. (A Gordon-type conference is an informal research review conference held under the auspices of the American Association for the Advancement of Science.)

Apart from the particular research subjects listed, the committee discussed several activities which might enhance the growth of understanding of the meteorology of air pollution problems. Among these might be especially noted: (a) the widest possible dissemination by an appropriate agency of present meteorological knowledge of atmospheric dispersion; (b) compilation and review of knowledge of the various aspects of air pollution meteorology, augmented by a broad reevaluation of practical applications and incorporated into a monograph summarizing the field and indicating research requirements; (c) further development of a centralized national network to collect data on air quality which is directed toward better establishing the trend of air pollution; and (d) evaluation of available methods of meteorological measurements for their applicability to community air pollution studies. With respect to items (a) and (b) above, it is recognized that knowledge of recent developments in the field is not shared widely, even among practicing meteorologists. The committee welcomes the fact that some pertinent information previously classified may soon become generally available.

Recommended Research

General

Design of a major air pollution investigation.

On the basis of the above design, organization of a comprehensive and definitive urban area study.

Instrumentation

Development of simple yet adequate meteorological instrumentation and methods of analysis of resulting data.

Development of inexpensive tracer techniques for meteorological use.

Model Studies

Development of scale model techniques for simulating atmospheric diffusion processes as related to area sources.

Development of methods for simulating terrain influences on air flow patterns.

Physical Processes

Studies of nucleation, atmospheric transmission, and absorption of solar radiation.

to that of the feed material; for example, relationship of particulate sulfate to sulfur dioxide (L).

Changes accompanying the aging of particulate pollutants (L).

Development and evaluation of devices for the controlled production of aerosols, such as are techniques and furnace methods (S).

Physical Properties of Aerosol Systems

Correlation of surface area with other properties (M).

Effect of aerosol shape on light scattering (M).

Dynamics of movement of particles in large volumes (M).

Development and evaluation of tracer techniques. Examples are:

Magnetic materials (S)

Natural germanium in coal, vanadium in oil (S)

Micro-organisms (S)

Automatic counting methods (S)

Sampling and Analysis

Behavior of particles approaching collecting surfaces (S).

Behavior of thermally conducting particles in a thermal gradient (S).

Development and evaluation of stack sampling equipment, such as high temperature aerosol cameras or counters, and particle size spectrometers (S).

Development and evaluation of new collectors, such as isokinetic samplers and wet collectors (S).

Application to aerosol analysis of special techniques. Examples are:

Infrared reflectance (S)

X-ray diffraction (S)

Chromatography (S)

Electrophoresis (S)

Interlaboratory comparison and statistical evaluation of analytical methods (M).

Gases

Gaseous Reactions

Photolysis of organic compounds in oxygen (M).

Rates and mechanism of elementary reactions in the photolysis of nitrogen dioxide with hydrocarbons in oxygen (M).

Photochemical reactions of effluents from known pollution sources, such as auto exhausts and incinerators (M).

Thermal reactions between ozone and unsaturated organic compounds (M).

Rates and mechanism of reactions occurring during incomplete combustion (L).

Nitrogen fixation in combustion equipment (M).

Sampling and Analysis

Collection of specific contaminants by means such as ion exchange resins and molecular sieves (S).

Development and evaluation of adsorption techniques for the concentration of air pollutants (M).

Development of techniques for the removal of specific substances such as water and carbon dioxide (S).

Development and evaluation of methods and equipment for low temperature condensation of pollutants (S).

Development of specific economical analytical methods suited to special needs. Examples are:

Ozone (S)

Acrolein (S)

Halogenated carbonyl compounds in the p.p.b. range (S)

Aldehydes (S)

Oxides of nitrogen (S)

Differentiation of sulfur compounds (S)

Development of bioassay methods such as enzymatic reactions and organism toxicity (S).

Interlaboratory comparison and statistical evaluation of analytical methods (M).

Development and evaluation of special non-specific analytical techniques. Examples are:

Microbiological indicators for physiological effects (S)

The vibrating reed surface potential apparatus (S)

Special mass spectrometric techniques: for example, to determine parent masses and/or negative ions (S)

Phosphorescence spectra and decay times for the identification of polycyclic hydrocarbons (S)

Other physical techniques including NMR, EMR, and microwave spectrometry (S)

Development of special analytical techniques

source through modification of the process or materials handled.

2. Control of contaminants at the source by suitable devices.

It is the opinion of the committee that the needed engineering research should be in two categories:

1. Problems for which early or prompt solution is desirable and practical. Included in this category are:

a) Control of pollutants associated with effluents from combustion operations, namely, particulates, certain acid gases such as oxides of sulfur and nitrogen, and hydrocarbons.

b) Specific area control problems associated with the effluents from the petroleum refining industry, the metallurgical industry, and the chemical industry.

2. Problems of a less urgent priority.

The general research program, as discussed by the committee, considered two divisions of these categories, namely, field studies and laboratory investigations.

It became apparent in discussing engineering research that instrumentation plays an important role, both in identification of a source and its magnitude and in the evaluation of control equipment. Some of the needed engineering research requires the prior development of suitable instrumentation.

Instruments urgently needed for research and control include:

a) An instantaneous quantitative gas spectrum analyzer.

b) Particle-size analyzer for the 0.01 to 0.3 micron range.

c) A rapid mass distribution analyzer for particulates in gas streams.

Also needed are the following:

a) Simple fluoride gas-aerosol discriminator.

b) Simple stack effluent weight analyzer.

c) Light scattering analyzer for solids in gas streams.

Problems Needing Prompt Solution

Field

Pollution of the atmosphere from solid fuel combustion processes, we believe, possesses such magnitude and characteristics that a qualitative

and quantitative assessment of these contaminants is necessary. This is best accomplished through a fundamental field investigation of:

1. The characteristics of the effluents resulting from solid fuel combustion processes.

2. The determination of factors affecting the formation of oxides of nitrogen.

The solid fuel process effluent characteristic evaluation should include the determination of physical characteristics of the solids and the assay of the chemical composition of the liquid and gaseous contaminant discharges.

Laboratory

Test Gas and Aerosol Preparation

Preparation of gas and aerosol simulants is an important aspect of the development and appraisal of engineering devices for control of air pollution. A fundamental investigation of means and methods of preparing gases to simulate atmospheres and processes is desirable and a similar approach to the preparation of aerosols of various physical properties, such as shape, size, specific gravity, and surface characteristics, is essential. Such aerosol preparation information is fundamental to the study of the behavior of aerosols both within quiescent atmospheres and in dynamic gas streams and in the study of the performance of various mechanisms for removal of aerosols.

Studies of Process Modifications

One of the important problems in air pollution control from a fundamental standpoint is to investigate the sources of air pollution as related to the industrial process. We believe that essential studies in modification of processes and materials handling, from a basic formation of contamination viewpoint, are of major importance. Modification or alteration of a process so as to eliminate the contamination obviously eliminates the need for further control equipment, and may contribute substantial economies. We believe that there are many unrealized opportunities for attack upon air pollution by this strategy.

Treatment of Gaseous Contaminants

Additional investigation is needed in the study of the absorption, adsorption, and chemical conversion of gases in such concentrations

Investigation of self-purification processes in the atmosphere.

Dispersion

Fundamental research on atmospheric turbulence and diffusion.

Study of persistent atmospheric conditions which tend to produce severe pollution.

Development of pollution potential indexes.

Investigation of the structure of the lower atmosphere in relation to basic diffusion processes, especially in urban areas.

Research on pollution from remote sources.

Theoretical studies of diffusion from large area and volume sources.

Study of the influence of heat sources and sinks on air pollution patterns.

Development of methods of interpreting climatological data for air pollution studies.

Investigation of the application of the methods of multiple-time series analysis, information theory and general stochastic procedures to the prediction of the probability distribution of the concentration of atmospheric pollution at a point.

Engineering Committee

LESLIE SILVERMAN, chairman

The objectives of engineering research in air pollution are to investigate, develop, and appraise mechanisms, devices, and processes for the control of air pollution and to define, measure, and evaluate air contamination from all sources. Control in this context encompasses the prevention of air contamination which may create a nuisance and which may be injurious to property, vegetation, animals, and human health and welfare.

Engineering research in the area of air pollution inherently includes economic considerations of control or elimination of contamination at the source. Many occurrences of air pollution result from a failure to consider those factors influencing air pollution. In this regard may be cited the fact that many otherwise well-designed processes consider only the product requirement and operational efficiency rather than the contaminants that may be discharged to the atmosphere as a result of the process. It is the opinion of the Engineering Committee

that this phase of the problem should be directed to the attention of those engineers who are responsible for process design.

The committee is aware of the fact that many of the problems now considered as critical can be solved without further research through the application of well-known and well-established control principles. However, it should be emphasized that one of the major phases of engineering research must be directed toward economic methods of control.

Considerable emphasis in air pollution control pertains to the effects of contaminants on property and vegetation susceptible to direct economic evaluation. The committee has considered these effects in addition to the health aspects of the problem.

One of the fundamental needs is perspective in consideration of the entire problem. This can be obtained only by giving consideration to future requirements while appraising present research in terms of its potential application to existing problems. The committee recognizes the value of such creative thinking in regard to engineering investigation in the air pollution area and feels that it should not be neglected in establishing any long-range research planning. Since the solution of many of the problems in air pollution requires various technical competencies in the engineering field as well as an engineering perspective toward the evaluation of source characteristics and control requirements, it is felt that the engineer, per se, is particularly adapted to the assessment of the basic problem.

The committee recognizes the essential need for definition of the air pollution problem in terms of relationships between pollutants and ill effects, whether in terms of human or animal response, vegetation injury, or material damage. It is further recognized that the rate of progress in solving air pollution problems is dependent to a considerable degree upon the rate at which these relationships can be established.

There are two fundamental engineering approaches to the problem of control of contamination in the atmosphere, and emphasis in research should be directed toward both:

1. The elimination of the contaminant at the

STATEMENT

*By the United Nations Scientific Committee
on the Effects of Atomic Radiation*

Responsibilities of the Medical Profession in the Use of Ionizing Radiation

THE UNITED NATIONS General Assembly, being aware of the problems in public health that are created by the development of atomic energy, established a Scientific Committee on the Effects of Atomic Radiation at its tenth session, 1955-56. This committee considers that one of its most urgent tasks is to collect as much information as possible on the amount of radiation to which man is exposed today, and on the effects of this radiation. Since it has become evident that radiation due to diagnostic radiology and to radiotherapy constitutes a substantial proportion of the total radiation received by the human race, the committee considers it desirable to draw attention to information that has been obtained on this subject.

Modern medicine has contributed to the control of many diseases and has substantially prolonged the span of human life. These results have depended in part on the use of radiation in the detection, diagnosis, and treatment of disease. There are, however, few examples of scientific progress that are not attended by some disadvantages, however slight. It is desirable therefore to review objectively the possible present or future consequences of increased irradiation of populations which result from these medical applications of radiation.

It is now accepted that the irradiation of human beings, and particularly of their germinal tissues, has certain undesirable effects. While many of the somatic effects of radiation may be reversible, germinal irradiation normally has an irreversible and therefore cumulative effect. Any irradiation of the germinal tissues, however slight, thus involves genetic damage which may be small but is nevertheless real. For so-

matic effects there may however be thresholds for any irreversible effects, although if so these thresholds may well be low.

The information so far available indicates that the human race is subjected to natural radiation, as well as to artificial radiation due to its medical applications, to atomic industry and its effluents, and to the radioactive fallout from nuclear explosions. The radiation due to natural sources has been estimated to cause between 70 and 170 millirem of irradiation to the gonads per annum in most parts of certain countries in which it has been studied, although higher values are found locally in some areas (1). The committee is aware of the potential hazards that both natural and artificial radiation involve, and it is collecting and examining information on these subjects.

The amount of radiation received by the population for medical purposes is now, in certain countries, the main source of artificial radiation and is probably about equal to that from all natural sources. Moreover, since it is given on medical advice, the medical profession exercises responsibility in its use.

The committee appreciates fully the importance and value of the correct medical use of radiation, both in the diagnosis of a large number of conditions, in the treatment of many such diseases as cancer, in the early mass detection of conditions such as pulmonary tuberculosis, and in the extension of medical knowledge.

Moreover, it appreciates fully the contribution of the radiological profession, through the International Commission on Radiological Protection in recommending maximum permissible levels of irradiation (2). As regards

that they are a nuisance or hazard. Such studies should include basic approaches to control of acid gases, including oxides of sulfur and nitrogen, and to the elimination of hydrocarbon vapor emissions. Emphasis should be placed on development of economically feasible methods and processes.

Tabulation of Needed Research

Field Investigations

Process Evaluation—Effluents

1. Compilation of characteristics and rates of effluent emissions.
2. Assessment of internal combustion engine emissions (urgent).
3. Determination of solid fuel process characteristics (urgent).
4. Appraisal of nitrogen oxide formation (urgent).
5. Relationship between transparent and opaque particulates.

Process Evaluation—Modifications

General investigation of process modifications for pollution control.

Control Equipment Evaluation

1. Establishment of incinerator design criteria.
2. Evaluation of filter devices.
3. Evaluation of inertial separators.
4. Determination of electrostatic precipitator performance.

Community Survey Techniques

1. Comparison of hourly dustfalls.
2. Acquisition of particle size data at ground level.

Laboratory Studies

Source Simulation

1. Preparation of test gases and aerosols (urgent).
2. Determination of properties, behavior, and methods of specification of aerosols (urgent).
3. Investigation of sampling methods (isokinetic).

Principles of Gas and Aerosol Control

1. Studies of process modifications (urgent).
2. Fundamental studies on filtration mechanisms.
3. Development of high temperature filter media.
4. Further studies on electrostatic phenomena.
5. Evaluation of droplet-type scrubbers.
6. Exploratory studies of less common mechanisms.
7. Fundamental treatment of gaseous contaminants (urgent):
 - a) Absorption and adsorption of SO_2 and SO_3 at low concentrations.
 - b) Oxides of nitrogen treatment and control.
 - c) Conversion studies including catalytic and noncatalytic combustion.

A New Device for Sputum Testing

A device that makes sputum testing for tuberculosis safer has been developed by a Veterans Administration bacteriologist.

A new type of paint shaker was modified for use as an agitator of sputum specimens by Abraham L. Rosenzweig at McGuire Veterans Administration Hospital in Richmond, Va. The device has been adopted by the 173 hospitals of the Veterans Administration.

During the vigorous agitation required in homogenizing viscous material, the standard agitator had to be anchored, and could not be secured easily under a safety hood to protect workers from live germs.

Because the main part of the new device does not vibrate, it reduces the potential danger from tuberculosis germs released by vibration into the air of the laboratory.



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Continued ►

frontispiece

See poliomyelitis vaccination reports on pages 381 and 393.
(Upper photograph by Esther Bubley for Wesleyan University
Press; lower photograph, National Foundation for Infantile
Paralysis.)

those whose occupation exposes them to radiation, the establishment of these levels depends on the view that there are doses which, according to present knowledge, do not cause any appreciable body injury in the irradiated individual; and also on the consideration that the number of people concerned is sufficiently small for the genetic repercussions upon the population as a whole to be slight. Whenever exposure of the whole population is involved, however, it is considered prudent to limit the dose of radiation received by germinal tissue from all artificial sources to an amount of the order of that received from the natural background radiation.

It appears most important, therefore, that medical irradiations in any form should be restricted to those which are of value and importance, *either in investigation or in treatment*, so that the irradiation of the population may be minimized without any impairment of the efficient medical use of radiation.

The committee is consequently anxious to receive information through appropriate governmental channels as to the methods and the extent by which such economy in the medical use of radiation can be achieved, both by avoiding examinations which are not clearly indicated and by decreasing the exposure to radiation during examinations, particularly if the gonads, or the fetus during pregnancy, lie in the direct beam of radiation. It seeks, in particular, to obtain information as to the reduction in radiation of the population which might be

achieved by improvements in instrument design, by fuller training of personnel, by local shielding of the gonads, by choosing appropriately between radiography and fluoroscopy, and by better administrative arrangements to avoid any necessary repetition of identical examinations.

The committee also seeks the cooperation of the medical profession to make possible an estimate of the total radiation received by the germinal tissue of the population before and during the childbearing age. It considers it to be essential that standardized methods of measurement, of types at present available, should be widely used to obtain this information and it emphasizes the value of adequate records, maintained by those using radiation medically, by the dental profession, and by the *responsible organizations in allowing such radiation exposure to be evaluated*. The committee is convinced that information of this type will make it possible to decrease the total medical irradiation of the population while preserving and increasing the true value of the medical uses of radiation.

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New Benefits for Disabled Children

A new type of social security benefit was paid for the first time in February 1957 to qualified workers' disabled children over the age of 18. Authorizing these benefits is a 1956 amendment to the Social Security law. Payments are provided for disabled children of retired or deceased workers after the children pass 18 years of age, if those children are unable to work and were disabled before age 18.

Nearly 3,000 applications for these insurance benefits were processed by the Bureau of Old-Age and Survivors Insurance during 1957. Estimated to be eligible for the payments during 1957 are more than 20,000 persons. They may receive benefits back to January 1957 if they apply through their local social security offices before the end of January 1958. After this date, benefits will not be paid retroactively for more than 12 months.

Implications of Recent Viral Studies

By ROBERT J. HUEBNER, M.D.

SOON AFTER the bacterial causes of respiratory illnesses were delineated, it was noted that certain filterable viruses also caused such diseases. When the viruses of influenza, psittacosis, and Q fever finally became known a few years ago, it seemed that the rest of the respiratory disease problem would be solved without difficulty. Only three more agents, the viral causes of the "common cold," of acute respiratory disease (febrile catarrh), and of primary atypical pneumonia remained to be found.

However, the number of viruses that might be involved was not realized. Indeed, quite recently, River's textbook, *Viral and Rickettsial Infections of Man*, listed only about 60 viral agents. Today, only a few years later, with the widespread application of new techniques now available in virology, more than 65 additional, newly recognized viruses have been demonstrated in man. One would be justified, therefore, in thinking that we now know much more about the viral causes of respiratory disease. True, we do know a little more. But while isolating viruses is no longer so difficult, the eventual solution of the problem of respiratory disease is more complex.

The "new" viruses are found with great frequency in the upper part of the respiratory tract and in the enteric tract. They have been

called "viruses in search of disease." Most of them are lumped under arbitrarily selected family designations such as Cocksackie, ECHO, and adenoviruses (APC-RI viruses); in addition, there are viruses such as the Sendai virus from Japan, various exanthema viruses including those reported by Neva and Rake, the virus of cytomegalic inclusion disease, and many other completely unclassified agents.

The discovery of these new agents has led to considerable progress in the etiological delineation of a number of common illnesses. It is well established that 6 to 8 of the group A Cocksackie viruses cause herpangina, a specific and very common upper respiratory disease of children with fever and other systemic involvement. Group B Cocksackie viruses have been shown to cause not only epidemic pleurodynia, but also nonbacterial meningitis, which until recently was probably most often diagnosed as nonparalytic poliomyelitis. Some of the viruses in the ECHO group, particularly type 6, have also been incriminated in the etiology of nonbacterial meningitis. The recently discovered adenoviruses cause febrile respiratory and ocular illnesses. Acute respiratory disease (ARD) of military recruits is known to be caused by at least three adenovirus serotypes. Other serotypes cause a newly described illness, pharyngoconjunctival fever (Greeley's disease), and still other types have been incriminated in the etiology of simple febrile pharyngitis and simple conjunctivitis. One type has been shown to be regularly associated with epidemic keratoconjunctivitis.

Polyvalent Vaccines

One of the more obvious opportunities provided by the easy demonstration and cultiva-

Dr. Huebner is chief of the Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases of the Public Health Service, Bethesda, Md. This paper is based on a talk at the Symposium on Psittacosis, New Jersey Agricultural Experiment Station, Rutgers University, February 17, 1956, and is included in the proceedings, Progress in Research and Control of Psittacosis, Rutgers University Press, New Brunswick, N. J.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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PUBLIC HEALTH SERVICE

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Bacterial Allergies

Of course, in addition to these rather unsubstantial ailments, there is a definite problem of specific microbial disease of nasal and pharyngeal areas, much of which is the consequence of acute infection. Here, again, it is pertinent to ask how much of recurrent respiratory illness might be due to bacterial allergies. Another hypothesis which possibly should be given more consideration is that some of the latent viruses, such as adenoviruses, persisting in the tissues of most respiratory tracts may become activated by undetermined factors and cause recurrent inflammation of the mucous membranes in those areas.

As in the case of recurrent herpes infection, such hypothetic occurrences might be expected to result in less severe illnesses than those produced by the primary infection. We have hesitated to suggest that reactivation of the adenovirus agents, demonstrably present in the nasopharyngeal passages of most persons, might represent a possible cause of common colds, since in most of those from whom such agents are recovered during afebrile illness there is generally no increase in adenovirus antibodies.

However, recurrent herpes virus infections also are not followed by any measurable antibody response. In view of the fact that adenoviruses have been isolated on several occasions from the respiratory secretions of persons with afebrile respiratory illnesses or typical common colds, the hypothesis that colds may be due to reactivation of these agents may possibly have been discarded too readily. After all, the activation of latent agents is not a rare or unknown phenomenon. The psittacosis virus in its natural host may be regarded as an agent essentially latent with the capacity of being activated at intervals. It is precisely during these exacerbations of infection and illness that birds become an important source of infection to other birds and to man.

"Unmasking" Viruses

The notable progress in the definition of acute viral diseases through application of new virological techniques is sure to be followed by more intensive application of these techniques. The development of even better ones offers

promise of further progress in the study of the varied causes of acute and chronic human disease. It seems inevitable, as new and different tissues are introduced and utilized in tissue culture, that many more viral agents will be encountered. The long-term culture of normal or abnormal tissues, which is essentially a simple, if newly applied, technique for isolating viruses, may possibly turn out to be of even greater importance.

Several years ago, Dr. Wallace P. Rowe and I described viruses emerging from the epithelial cell outgrowths of human adenoids. These agents, which had a special tropism for human epithelial cells, were the first representatives of the adenovirus family of viruses to be recognized; they were found in the epithelial cells of most adenoids and tonsils, generally after 18 to 30 days of continuous culture of the original cells. They could not be demonstrated in such tissues by conventional methods of virus isolation. Serotypes 1, 2, and 5, the most commonly encountered, were subsequently shown to be acquired most often in early childhood, yet they are unmasked from the adenoids of older children and adults quite as readily as from those of infants. There is little question that following primary infection these viruses become latent or chronically infecting particles. More recently, we also succeeded in unmasking the salivary gland virus, the cause of cytomegalic inclusion disease, from the fibroblastic outgrowth of adenoids.

This agent, which was only recently first isolated in tissue culture by Dr. Margaret Smith, has long been a collector's item among pathologists who specialize in recognizing its existence in fixed tissue taken at autopsy. Subsequently, our research group and Dr. Thomas Weller at Harvard also demonstrated the agent in adenoid tissues, in biopsy of liver tissue, and from the urine of living persons, some with evidence of cytomegalic inclusion disease.

With the development of serologic techniques for studying this agent, it now appears that the salivary gland virus is a widespread infectious agent in man, approaching almost total infection in older age groups. We have also occasionally picked up herpes virus in tissue cultures of adenoid cells, and it is noteworthy that we succeeded in isolating three separate viruses,

tion of so many new viruses is the preparation of effective prophylactic vaccines for the prevention of some of the very common nonfatal illnesses. Last year, our group at the National Institute of Allergy and Infectious Diseases, Public Health Service, reported a successful test of an adenovirus vaccine in which we were able to show good protection of vaccinated volunteers against experimentally induced attacks of pharyngoconjunctival fever.

At the present time Dr. Joseph Bell and I, in cooperation with U. S. Navy Medical Research Unit No. 4, are engaged in field trials of a commercially produced polyvalent vaccine containing adenoviruses types 3, 4, and 7. These studies are being carried out at the Great Lakes Naval Training Station, Great Lakes, Ill., and will eventually embrace observations on some 16,000 military recruits. Preliminary analysis of data now available show that in the vaccinated recruits there is at least a 50 percent reduction from expected rates of acute respiratory disease. These results are encouraging, not only because it may now be possible to prevent some of the more severe respiratory viral diseases, but also because they suggest that similar vaccines can be made, if it proves desirable, against representatives of the other new groups of agents, such as Cocksackie, ECHO, and exanthema viruses.

What bearing do these new developments have on the total problem of acute respiratory disease? Unfortunately, despite the notable progress in finding the etiological agents of respiratory diseases, the cause of most of them must apparently still be found, particularly the causes of those generally termed "common cold."

Of course, a good deal depends on what is meant by "common cold." To begin with, it is not the only term in popular use. "Virus X" has some obscure yet special meaning to some lay groups. Physicians in many areas use the terms "virus infection" or "virus" to characterize essentially unexplainable illnesses. It seems only a matter of time before a new virus, known as "virus X²" will emerge.

In my opinion, the term "common cold" requires considerable analysis. Recent work with volunteers has convinced some of us that a large number of so-called common colds are

not due to viruses but to other factors, not the least of which are of psychosomatic origin. The nasopharyngeal symptoms of the common cold have occurred in a high proportion of volunteers, whether or not they received virus-containing or virus-free materials. Evaluation of some of these volunteers showed in psychological tests a rather significant association of high gullibility scores with complaints of upper respiratory illness. Although more work will be necessary to put these observations on a solid basis, our findings in numerous volunteer studies indicate that susceptibility to suggestion represents a more powerful inciter of "runny" noses than any virus which we have as yet discovered.

Well-controlled evaluations of the prophylactic value of common cold vaccines and the therapeutic effects of antihistamines have shown that innocuous control materials have remarkable effects in the apparent prevention and cure of colds. More significant perhaps than the fact that these control materials seemed to perform quite as well as the presumably active materials being tested was the fact that 50 percent or more of persons receiving simple saline vaccines and sugar pills in double-blind studies regularly reported prevention, modification, or cure of colds by these innocuous substances.

Loosli's recent studies of the occurrence of common colds in industry showed that a comparatively small number of industrial workers contributed most of the absenteeism attributable to common colds. It is difficult for a virologist to conceive of viruses behaving in so illogical a manner. I might add, as the father of 8 children, 6 of whom are in school, that I cannot escape the feeling that there is very definite association of "colds" with Monday mornings. It is difficult to think of even "virus X" as causing these Monday morning episodes. Perhaps there is a "Monday morning" virus. However, I think the Victorians had a better word for it. The expression "she is indisposed" occurs time and time again in Victorian literature. It is possible, of course, that occasionally this truly represented a "viral indisposition," but I wonder whether such a virus could be grown even with modern tissue cultures or that present or future miracle drugs could cure it.

Surveillance of Poliomyelitis in the United States in 1956

COLLECTION and dissemination of epidemiological data on the safety and effectiveness of poliomyelitis vaccine are the primary functions of the National Poliomyelitis Surveillance Program, which was established in April 1955 at the Communicable Disease Center of the Public Health Service. These data are summarized and distributed currently in the mimeographed Poliomyelitis Surveillance Reports, which are available to all persons with responsibility in the control of poliomyelitis. A review of information collected in 1955 has been published (1). The present report summarizes the data for 1956.

As part of the surveillance program a clearinghouse of information is maintained in the Poliomyelitis Surveillance Unit, Communicable Disease Center. There is constant mutual exchange of data between the unit and State and local health departments, virus diagnostic laboratories, the National Foundation for Infantile Paralysis, and others. More than 40 officers of the Communicable Disease Center's Epidemic Intelligence Service contribute to this activity.

This report was prepared by the staff of the Poliomyelitis Surveillance Unit: Dr. Neal Nathanson, chief; Dr. William Jackson Hall, assistant chief; Dr. Lauri D. Thrupp, epidemic intelligence service officer; and Helen Forester, statistician. The unit is part of the Epidemiology Branch (of which Dr. Alexander D. Langmuir is chief), Communicable Disease Center, Public Health Service, Atlanta, Ga. The paper was presented at a meeting of representatives of State medical societies, called by the American Medical Association, in Chicago. January 26, 1957.

Poliomyelitis Incidence in 1956

During 1956 a total of 15,400 cases of poliomyelitis were reported to the National Office of Vital Statistics, Public Health Service, a rate for the United States of 9.2 cases per 100,000 population. This is the lowest rate reported since 1947. Marked annual variations in poliomyelitis incidence are apparent from a comparison of rates for the years 1910 through 1956 (fig. 1) and from a comparison of poliomyelitis incidence by weeks for 1956 with the years 1946 through 1955 (fig. 2). Because of these wide annual variations in incidence, it is not yet possible to attribute the low incidence reported in 1956 to the widespread, although incomplete, use of poliomyelitis vaccine. Further decreases in incidence over the next several years may be of greater significance.

The 1956 incidence rates for six geographic regions, with median rates for the period 1951-55, appear in table 1. The highest regional rates in 1956 were in the Southwest, the South Central, and the North Central States; these same regions also had the highest 5-year median rates. Lowest 1956 rates and lowest 5-year median rates were reported for the Northeast and the Southeast.

For individual States a similar comparison of 1956 rates with 5-year median rates appears in figure 3. (The number of cases reported in 1956 for each State, by paralytic status, is given in table 2.) The four States with the highest 1956 rates were Utah, Iowa, Louisiana, and Illinois, in that order. None of these States experienced particularly low median rates for the previous 5 years. The high 1956 incidence in Utah reflects an epidemic in Salt Lake City and the surrounding area. The cases reported

an adenovirus, the salivary gland virus, and the herpes virus from the epithelial and fibroblastic outgrowth of the adenoid of one person.

The recent report that many different viruses have been isolated from monkey renal tissues which had been used in the production of poliomyelitis vaccine represents another interesting example of the "unmasking" of viruses from cells. The many ideas implicit in new information of this sort cannot be developed here. Perhaps the most important point is that whole areas of acute and chronic human disease, unexplained except that they are assumed to be noninfectious in origin, must be reexamined in the light of the new concepts concerning the nature and consequences of viral infections.

The simple fact that from two tissues, the *human adenoid of man and the kidney of the monkey*, 25 or more immunologically distinct viruses have been unmasked, supports the con-

cept that the human cell itself must be regarded as having a considerable viral flora. Should this concept, which of course is not new to those working with bacterial and plant viruses, prove to be true, it cannot fail to have tremendous influence upon future investigations into the cause of human disease, regardless of its apparent lack of connection with microbial infection. For instance, a virologist can hardly conceive how human cells could remain uninfluenced by the viruses growing within them, and, furthermore, how such experiences could fail to be an important factor in the malfunction and erosion of cells which the clinician calls "degenerative or chronic disease."

It seems to me only a matter of time until the clinician and virologist find themselves collaborating not only in an effort to cure sick cells but also in attempting to prevent such occurrence.

Board of Regents of the National Library of Medicine

Dr. Worth B. Daniels, clinical professor of medicine at Georgetown University, was elected chairman of the Board of Regents of the National Library of Medicine. At its first meeting, March 20, 1957, the 17-member board also elected as vice chairman Dr. Champ Lyons, professor of surgery, University of Alabama Medical College, and as secretary of the board, Lt. Colonel Frank B. Rogers, library director. The board is authorized by the 84th Congress to advise the Surgeon General of the Public Health Service on the policy of the library.

Ten board members are appointed by the President from the fields of science, medicine, and public affairs, and seven are ex officio members in Government service. The chairman is elected from among the appointed members.

Other appointed members of the board are: Dr. Basil G. Bibby, professor of dentistry, University of Rochester; Dr. Jean A. Curran,

Bingham Associates Fund, Boston; Dr. Michael E. Debakey, professor of surgery, Baylor University; Dr. Thomas Francis, Jr., professor of epidemiology, University of Michigan; Miss Mary Louise Marshall, professor of medical bibliography, Tulane University; Dr. I. S. Ravdin, professor of surgery, University of Pennsylvania; Dr. Benjamin Spector, professor of anatomy, Tufts University; Dr. Ernest Volwiler, president, Abbott Laboratories.

Ex officio members are: Dr. Leroy E. Burney, Surgeon General, Public Health Service; Major General S. B. Hays, Surgeon General, U. S. Army; Rear Admiral B. W. Hogan, Surgeon General, U. S. Navy; Major General D. C. Ogle, Surgeon General, U. S. Air Force; Dr. William S. Middleton, chief medical director, Veterans Administration; Dr. John T. Wilson, assistant director for biological and medical sciences, National Science Foundation; and Dr. L. Quincy Mumford, Librarian of Congress.

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from Iowa undoubtedly include many cases of nonpoliomyelitis viral meningitis since less than 10 percent of the cases were reported as paralytic and since isolations of Coxsackie virus were reported from outbreaks in four areas of the State. Only in Louisiana did reported incidence exceed the 5-year median; high endemic rates were reported in several areas of this State. The largest concentrated outbreak during 1956 occurred in Chicago. More than 1,100 cases were reported, a rate of about 30 per 100,000.

Vaccine Safety

Surveillance of vaccine safety is based primarily on analysis of poliomyelitis cases occurring within 30 days of a poliomyelitis vaccination. Cases of this kind are routinely reported to the Poliomyelitis Surveillance Unit by all State and Territorial health departments. In addition, this phase of the program includes collection of some data on possible reactions to the vaccine.

Poliomyelitis Following Vaccination

With more than 70 million inoculations of vaccine given during 1956 and with considerable amounts of vaccine used in high-incidence areas, it is clear that by coincidence alone a large number of cases would be expected to occur shortly after vaccination. Thus, the purpose of surveillance of vaccine safety

is to determine whether coincidence is an adequate explanation for all the cases occurring shortly after vaccination. It must be recognized, now that vaccine is frequently used during periods of high incidence, that epidemiological methods may not detect the occurrence of small numbers of vaccine-related poliomyelitis cases.

Cases are currently analyzed for (a) excessive frequency of association with individual lots of vaccine, (b) concentration within the 4- to 11-day period of the intervals between inoculation and onset, and (c) correlation between sites of inoculation and sites of first paralysis. These were the distinguishing epidemiological characteristics of the cases in 1955 associated with vaccine manufactured by Cutter Laboratories (1).

During 1956, 500 under-30-day cases were reported, 229 of which were paralytic. (This total does not include a group of more than 300 cases in Chicago, which will be discussed in a later section of this paper.) Comparison of these 229 paralytic cases with the 70 million doses of vaccine administered gives an average ratio of about 1 paralytic case for every 300,000 inoculations. Classification of cases according to manufacturers and lot numbers of the vaccine used showed that only 5 lots distributed in 1956 were associated with more than 5 paralytic cases, while half (67) of the lots were not associated with any paralytic cases. Analysis of the 5 lots associated with more than 5 paralytic

Figure 1. Annual poliomyelitis incidence rates in the United States, 1910-56.

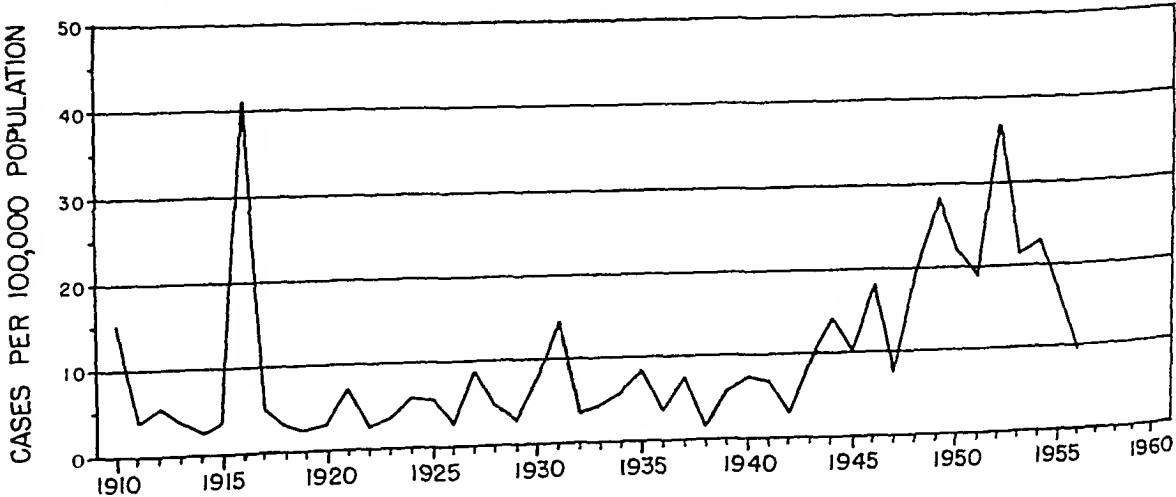
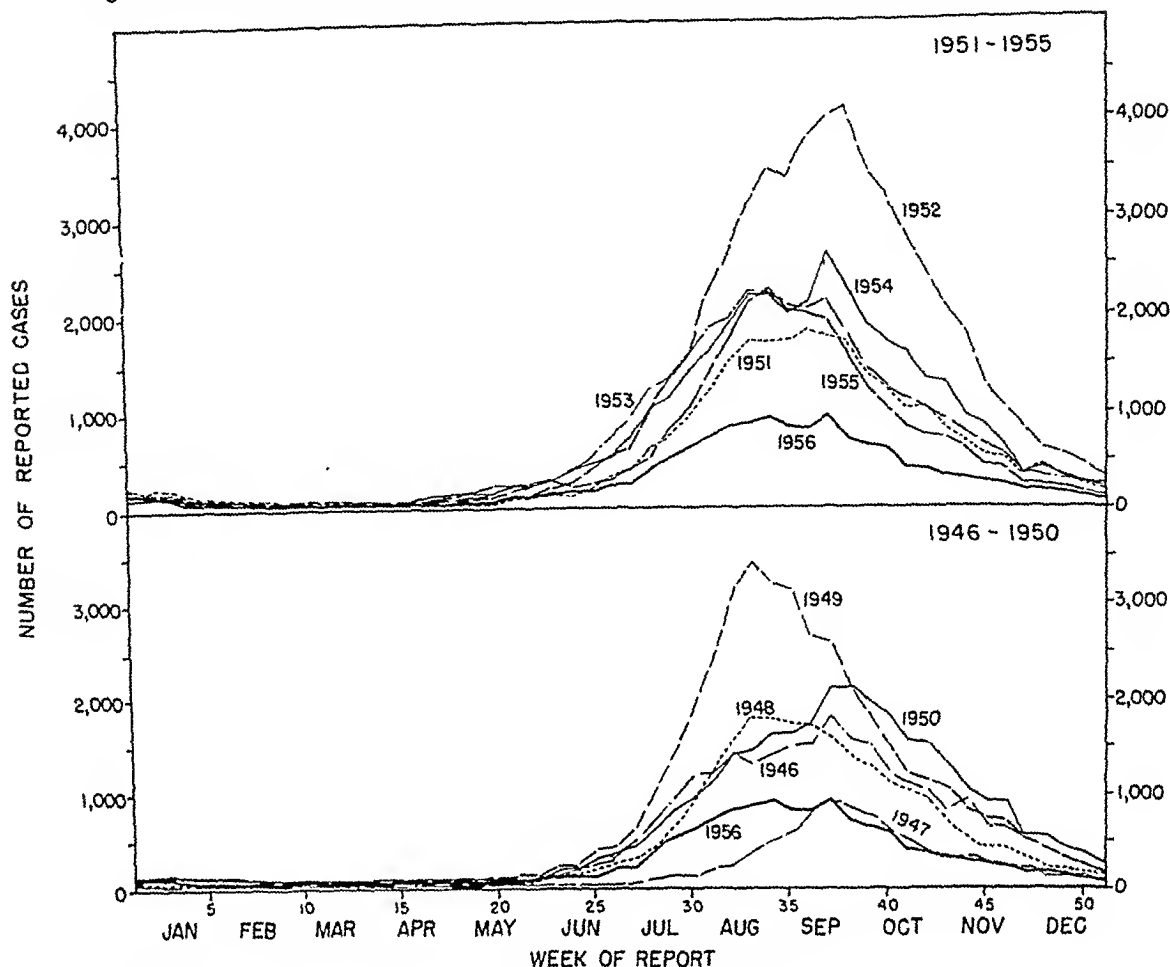


Figure 2. Poliomyelitis incidence in 1956 compared with the years 1946 through 1955.



NOTE: Data provided by National Office of Vital Statistics, Public Health Service.

cases showed that in all instances these lots had been used during the summer and in areas experiencing high or epidemic incidence of the disease and that these cases did not exhibit the other epidemiological characteristics of the Cutter cases.

When intervals between inoculation and onset were examined for the 229 paralytic vaccinated cases, it was found that 53 percent of the cases occurring 0-15 days after inoculation fell in the 4- to 11-day period, very close to the 50 percent expected by chance. The corresponding percentage for the Cutter cases was 88.

Analysis of the relationship between sites of inoculation and first paralysis showed the following: Of the 229 paralytic cases, 164 had spinal involvement, and of these 164, the site of

inoculation was known for 150. Among these 150, initial involvement included either the inoculated or the opposite uninoculated extremity, or both, in 31. Of these 31, only the inoculated limb was involved in 21, only the opposite uninoculated limb was involved in 6, and both limbs were involved in 4. This slight excess of correlated cases (21) over uncorrelated cases (6) may indicate the occurrence of a small number of vaccine-related cases. However, the correlated cases were spread among 19 lots of vaccine. Also, analysis of a comparison group of 905 cases that occurred more than 30 days after vaccination showed a similar excess of correlated over uncorrelated cases (13 and 6, respectively). Although the frequency of correlation in the small group of under-30-day cases suggests vaccine-related poliomyelitis, the

similar frequency of correlation for the over-30-day cases precludes any definite conclusion. However, if it is assumed that the excess of 15 correlated under-30-day cases was due to prior inoculation, then the vaccine has influenced the development of considerably less than one paralytic case per million inoculations.

Vaccine Reactions

Vaccine reactions that have been considered possible hazards include encephalitis or other neurological illnesses such as may occur following use of smallpox or other vaccines; allergic reactions to the traces of penicillin and foreign proteins in the vaccine; nephritis or other renal diseases attributable to reaction to residual monkey kidney proteins in the vaccine; and sensitization of Rh negative persons by Rh positive antigen potentially present in the vaccine. To evaluate these hazards, the Poliomyelitis Surveillance Unit has collected reports

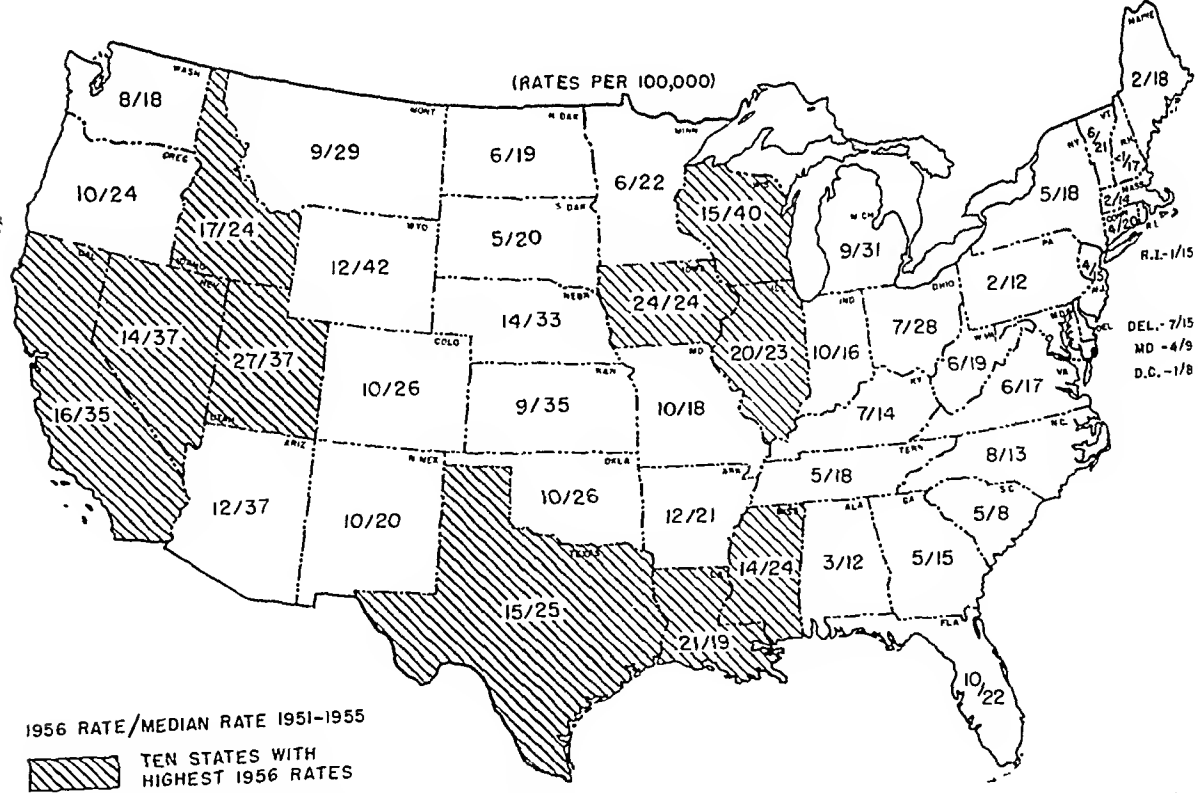
Table 1. Reported poliomyelitis incidence rates for 1956 and median rates for 1951-55, by geographic region

| Region ¹ | Rate for 1956 ² | Median rate for 1951-55 ² |
|---------------------|----------------------------|--------------------------------------|
| United States----- | 9.2 | 23 |
| Northeast----- | 3.5 | 17 |
| North Central----- | 11.9 | 27 |
| Northwest----- | 9.7 | 24 |
| Southeast----- | 5.9 | 18 |
| South Central----- | 15.1 | 27 |
| Southwest----- | 15.6 | 36 |

¹ See table 2 for States included in each region.
² Per 100,000 population.

of a number of nonpoliomyelitis illnesses occurring shortly after vaccination. Although the reports are undoubtedly incomplete and no final evaluation can be reached at present, the following observations can be made:

Figure 3. Poliomyelitis incidence rates in 1956 compared with median rates in 1951-55.



NOTE: Based on data provided by the National Office of Vital Statistics, Public Health Service, and the Bureau of the Census.

Table 2. Number of poliomyelitis cases reported in the United States and Territories, by State and paralytic status, 1956¹

| Region and State | Para-lytic | Non-para-lytic | Total ² | Region and State | Para-lytic | Non-para-lytic | Total ² |
|----------------------------|------------------|------------------|--------------------|----------------------------|------------------|------------------|--------------------|
| Northeast | 463 | 573 | 1,471 | Southeast | 940 | 795 | 1,971 |
| Maine..... | 16 | 4 | 22 | Delaware..... | 10 | 18 | 28 |
| New Hampshire..... | (³) | 1 | 3 | Maryland..... | 89 | 22 | 111 |
| Vermont..... | 12 | 9 | 21 | Dist. of Columbia..... | 7 | 4 | 11 |
| Massachusetts..... | 44 | 50 | 111 | Virginia..... | 150 | 84 | 236 |
| Rhode Island..... | 1 | (³) | 9 | West Virginia..... | 60 | 47 | 114 |
| Connecticut..... | 28 | 55 | 86 | North Carolina..... | 178 | 144 | 336 |
| New York..... | 289 | 357 | 797 | South Carolina..... | 38 | 56 | 114 |
| New Jersey..... | 73 | 97 | 212 | Georgia..... | 77 | 66 | 197 |
| Pennsylvania..... | (³) | (³) | 210 | Florida..... | 103 | 170 | 365 |
| North Central | 2,123 | 2,403 | 5,856 | Kentucky..... | 75 | 88 | 200 |
| Ohio..... | 165 | 146 | 628 | Tennessee..... | 91 | 55 | 156 |
| Indiana..... | 179 | 125 | 433 | Alabama..... | 62 | 41 | 103 |
| Illinois..... | 964 | 630 | 1,843 | South Central | 1,516 | 928 | 2,723 |
| Michigan..... | 283 | 323 | 683 | Mississippi..... | 154 | 66 | 296 |
| Wisconsin..... | 199 | 189 | 554 | Arkansas..... | 144 | 77 | 221 |
| Minnesota..... | 66 | 130 | 205 | Louisiana..... | 427 | 195 | 622 |
| Iowa..... | 44 | 526 | 629 | Oklahoma..... | 67 | 30 | 224 |
| Missouri..... | 117 | 133 | 421 | Texas..... | 724 | 560 | 1,360 |
| North Dakota..... | 7 | 27 | 40 | Southwest | 1,484 | 1,035 | 2,814 |
| South Dakota..... | 3 | 13 | 38 | Colorado..... | 86 | 67 | 162 |
| Nebraska..... | 42 | 110 | 195 | New Mexico..... | 36 | 21 | 84 |
| Kansas..... | 54 | 42 | 187 | Arizona..... | 73 | 54 | 130 |
| Northwest | 242 | 184 | 565 | Utah..... | (³) | (³) | 224 |
| Montana..... | 32 | 15 | 55 | Nevada..... | 1 | 2 | 35 |
| Wyoming..... | 20 | 12 | 37 | California..... | 1,288 | 891 | 2,179 |
| Idaho..... | 43 | 21 | 110 | Total | 6,768 | 5,918 | 15,400 |
| Washington..... | 71 | 60 | 190 | Alaska..... | 7 | 2 | 12 |
| Oregon..... | 76 | 76 | 173 | Hawaii..... | 51 | 17 | 68 |
| | | | | Puerto Rico..... | 45 | 6 | 51 |

¹ Provisional data reported to the National Office of Vital Statistics, Public Health Service.

² Includes cases reported with paralytic status unspecified (2,714 for the United States).

³ None of the cases reported so designated.

• Vaccine reactions are rare.

• Neurological illnesses following vaccination include 2 cases of encephalitis, 5 cases of myelitis, 1 sudden death (no definite cause found on autopsy), and a small number of minor self-limited illnesses such as meningismus, febrile convulsions, and labyrinthitis. It appears unlikely that these illnesses are related to prior vaccination, but further information must be collected, particularly on cases of encephalitis and myelitis, before any final evaluation can be reached.

• Local or generalized mild allergic reactions (such as urticaria) may occur in rare instances following vaccination. Two reports have been received of more severe dermatological illnesses following vaccination, but their relationship to prior inoculation appears questionable.

Table 3. Percentage distribution of paralytic and nonparalytic poliomyelitis cases, by age group, 1952, 1955, 1956¹

| Age group (years) | Percent distribution | | | | | |
|--------------------|----------------------|------------|------------|--------------|------------|------------|
| | Paralytic | | | Nonparalytic | | |
| | 1952 | 1955 | 1956 | 1952 | 1955 | 1956 |
| 0-4..... | 29 | 32 | 39 | 21 | 19 | 20 |
| 5-9..... | 24 | 21 | 16 | 31 | 29 | 27 |
| 10-14..... | 13 | 12 | 11 | 16 | 17 | 16 |
| 15 and over..... | 33 | 34 | 34 | 31 | 34 | 37 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

¹ Based on provisional data, including 21,971 cases from 22 States in 1952, 18,378 cases from 34 States in 1955, and 10,286 cases from 45 States in 1956. Cases in which paralytic status was not stated are excluded.

- There have been no reports of nephritis or other renal disease following vaccination.
- There have been no reports of hematological illnesses in which vaccine was considered to play a role.

Vaccine Effectiveness

Evaluation of vaccine effectiveness includes an analysis of the age distribution of cases by vaccination and paralytic status, a special study of the frequency of paralysis in hospitalized patients according to number of vaccine doses, special studies in three States comparing attack rates among vaccinated and unvaccinated children, and an analysis of reports of cases among persons who had received three doses of vaccine.

Age Distribution Analysis

During 1956, 44 States, the District of Columbia, and 3 Territories cooperated with the Poliomyelitis Surveillance Unit in an age distribution study. They reported to the unit the age, paralytic status, and vaccination history of all verified cases of poliomyelitis. These cases represent about three-fourths of all cases reported for the Nation. Data by age and paralytic status for 1955 and 1952, collected from a number of States in a similar study conducted in 1955, were available for comparison. Three separate qualitative measures of vaccine effectiveness are apparent from a preliminary analysis of the 1956 data in relation to the earlier data.

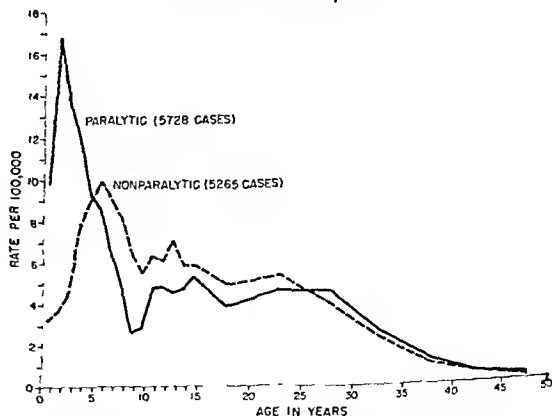
A definite shift was observed in the age distribution of paralytic cases. In comparison with data for 1955 and 1952, 1956 data showed an increase in relative incidence in the under-5-year age group, with a compensatory decrease in the relative incidence in the 5-to-9-year age group (table 3). No significant change was apparent in the age distribution of nonparalytic cases. This shift in age distribution of paralytic cases may be associated with the known fact that the young school age group was more extensively vaccinated than the preschool age group. In particular, children in the first and second grades of school in the spring of 1955, who were largely 8- and 9-year-olds during the past poliomyelitis season, were thoroughly vac-

inated in school clinics sponsored by the National Foundation for Infantile Paralysis. The reduction in paralytic incidence in this group is apparent in figure 4, which shows age-specific attack rates by single years of age. The paralytic age curve peaks sharply at age 1 and decreases rapidly through age 6. Except for the trough at ages 8 and 9, the age-specific rates remain relatively constant from ages 7 to 30, decreasing gradually thereafter.

Although the overall frequency of paralysis by age groups was similar to that reported in 1955 (table 4), the frequency of paralysis among reported cases in the under-20-year age group was markedly lower among vaccinated cases, 34 percent, than among unvaccinated cases, 60 percent (table 5). This difference supports the conclusion that vaccination prevented some paralysis.

Among the paralytic cases reported during the midsummer season in the under-20-year age group, 21 percent were vaccinated (table 6). This figure may be compared with estimates of the proportion of the population under 20 that had received one or more doses by that time. A conservative figure is 50 percent. The difference points to a vaccine effectiveness of the order of 75 percent against paralytic poliomyelitis. (Seventy-nine percent of the paralytic cases occurring in the unvaccinated population and 21 percent occurring in the same number of vaccinated persons indicate a reduction in the vaccinated rate compared with the unvac-

Figure 4. Age distribution of poliomyelitis in the United States, 1956.



NOTE: Preliminary and incomplete data from 45 States.

Table 4. Frequency of paralysis in poliomyelitis cases, by age group, 1952, 1955, and 1956¹

| Age group (years) | Percent paralytic | | |
|-------------------|-------------------|------|------|
| | 1952 | 1955 | 1956 |
| 0-4----- | 69 | 65 | 69 |
| 5-9----- | 56 | 44 | 40 |
| 10-14----- | 57 | 44 | 43 |
| 15 and over----- | 64 | 53 | 50 |
| All ages----- | 62 | 52 | 52 |

¹ Based on provisional data, including 21,971 cases from 22 States in 1952, 18,378 cases from 34 States in 1955, and 10,286 cases from 45 States in 1956. Cases in which paralytic status was not specified are excluded.

inated rate proportional to the reduction from 79 to 21. This reduction is $(79-21) \div 79 = 73$ percent.) A similar computation may be made for the 5-to-9-year age group. It is estimated that at least two-thirds of this age group had been vaccinated, while one-third of the paralytic cases in the age group were vaccinated (fig. 5 and table 6). This difference again leads to a crude estimate of 75 percent effectiveness against paralytic poliomyelitis. (Two-thirds of the paralytic cases occurring in the unvaccinated population and one-third in twice as many vaccinated persons indicate a reduction in the vaccinated rate compared with the unvaccinated rate proportional to the reduction from $\frac{2}{3}$ to $\frac{1}{3} \div 2$. This reduction is $(\frac{2}{3} - \frac{1}{3}) \div \frac{2}{3} = 75$ percent.)

The National Foundation for Infantile Paralysis conducted a study of hospitalized poliomyelitis patients during the height of the 1956 poliomyelitis season. Reports were received on 3,198 patients with acute cases in 408 hospitals in 48 States. When these patients were grouped according to number of vaccine doses received prior to onset, the frequency of paralysis declined progressively from 59 percent among unvaccinated patients to 23 percent among those who had received three doses (fig. 6). Thus, this study provides additional evidence of the effectiveness of the vaccine in 1956.

Special Studies in Three States

During the past year California, Florida, and Minnesota were able to follow the distribution of vaccine in sufficient detail to obtain reasonable estimates of vaccinated populations by age groups. Current State estimates of the total population in the age groups studied were used. After estimation of the size of the vaccinated group, the size of the unvaccinated group was obtained by subtraction. Attempts at direct measurement of vaccine effectiveness during 1956 in preventing paralytic poliomyelitis were thus possible in these States.

Several factors introduce sources of potential bias in these analyses. Case reports were received through morbidity reporting systems of widely varying accuracy. Total population

Table 5. Frequency of paralysis in poliomyelitis cases, by age and vaccination history, 1956¹

| Age group (years) | Vaccinated ² | | Not vaccinated | | Total | |
|-------------------|-------------------------|-------------------|----------------|-------------------|-------------|-------------------|
| | Total cases | Percent paralytic | Total cases | Percent paralytic | Total cases | Percent paralytic |
| 0-4----- | 610 | 46.7 | 2,471 | 73.9 | 3,081 | 68.5 |
| 5-9----- | 1,026 | 27.2 | 1,144 | 50.9 | 2,170 | 39.7 |
| 10-14----- | 461 | 30.8 | 939 | 49.1 | 1,400 | 43.1 |
| 15-19----- | 103 | 31.1 | 783 | 45.8 | 886 | 44.1 |
| 0-19----- | 2,200 | 33.5 | 5,337 | 60.5 | 7,537 | 52.6 |
| 20 and over----- | 152 | 33.6 | 2,597 | 53.0 | 2,749 | 51.9 |
| Total----- | 2,352 | 33.5 | 7,934 | 58.0 | 10,286 | 52.4 |

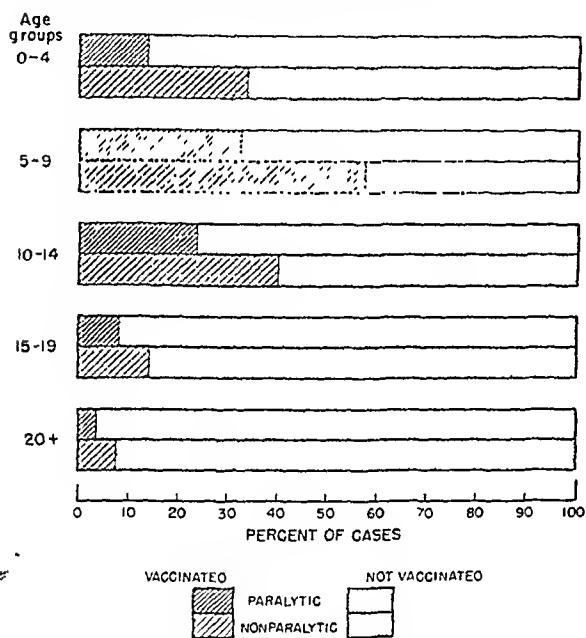
¹ Based on preliminary and incomplete data from 45 States. A total of 1,107 cases, representing 10 percent of the total reported cases in these States, are excluded because one or more of the following were reported as

unknown: paralytic status, vaccination history, month of onset, or age.

² Cases with one or more inoculations prior to onset are classified as vaccinated.

figures and vaccine usage figures (particularly for commercial supplies of vaccine) were necessarily estimates. Variations in geographic and age-specific vaccination rates and attack rates could not be completely accounted for. Risk of exposure was assumed to be equal in the two populations and constant throughout the study period. Although attempts have been made to minimize the effect of these sources of error, interpretations of the results must necessarily be guarded.

Figure 5. Percentage of paralytic and nonparalytic poliomyelitis cases reported as vaccinated and as not vaccinated, 1956.



NOTE: Preliminary and incomplete data from 45 States.

Estimates of effectiveness according to numbers of doses are not reported here. Thus, the estimates represent overall effectiveness of varying composites of 1, 2, and 3 doses of vaccine and should be interpreted accordingly.

Preliminary results of these studies are summarized in table 7. In each State, paralytic attack rates were significantly lower among vaccinated persons than among unvaccinated persons. Each of these independent studies indicates an overall vaccine effectiveness in preventing paralytic poliomyelitis of about 75 percent. These results are in general agreement with results of similar analyses conducted in 1955 (1).

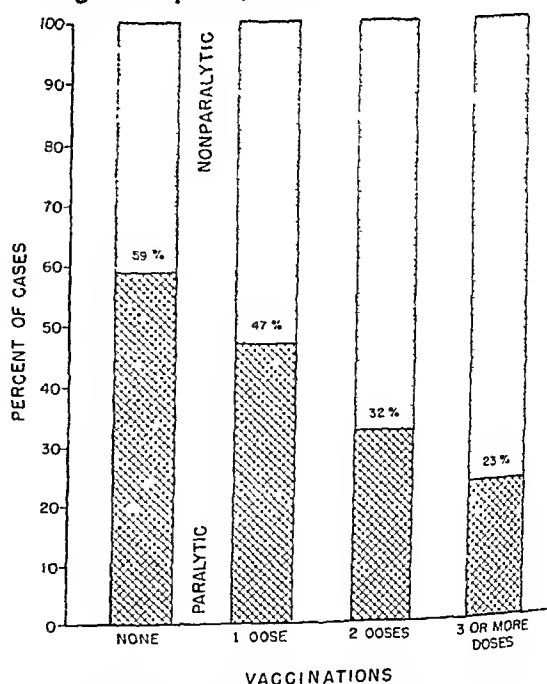
Triple-Vaccinated Cases

In September 1956 a national registry was established in the Poliomyelitis Surveillance Unit for reports of poliomyelitis among individuals who have received three doses of vaccine. Recorded data include clinical, epidemiological, and laboratory information. Residual paralysis is being documented by convalescent muscle gradings or supplemental descriptions from attending physicians. In a few cases followup information has resulted in a revised diagnosis or changed paralytic or vaccination status. Triple-vaccinated cases reported through January 18, 1957, have received the following classifications:

| | Number of cases |
|--|-----------------|
| Nonparalytic..... | 154 |
| Paralytic..... | 34 |
| Confirmed, with residual paralysis..... | 19 |
| Under investigation..... | 9 |
| Revoked (not paralytic or not vaccinated)..... | 6 |
| Total cases..... | 188 |

More stringent criteria have been applied in establishing these triple-vaccinated cases as par-

Figure 6. Frequency of paralysis in hospitalized cases of poliomyelitis, by vaccination history, Aug. 15-Sept. 30, 1956.



NOTE: Data from a survey by the National Foundation for Infantile Paralysis.

Table 6. Percentage of poliomyelitis cases reported as vaccinated, by paralytic status, age group, and month of onset, 1956¹

| Age group (years) | January-June | | July-November | | Total | |
|---------------------------|--------------|---------------------------------|---------------|---------------------------------|-------------|---------------------------------|
| | Total cases | Percent vaccinated ² | Total cases | Percent vaccinated ² | Total cases | Percent vaccinated ² |
| Paralytic cases | | | | | | |
| 0-4..... | 694 | 8.4 | 1,417 | 16.0 | 2,111 | 13.5 |
| 5-9..... | 257 | 29.6 | 604 | 33.6 | 861 | 32.4 |
| 10-14..... | 172 | 15.1 | 431 | 26.9 | 603 | 23.5 |
| 15-19..... | 91 | 2.2 | 300 | 10.0 | 391 | 8.2 |
| 0-19..... | 1,214 | 13.3 | 2,752 | 20.9 | 3,966 | 18.7 |
| 20 and over..... | 353 | 1.4 | 1,074 | 4.3 | 1,427 | 3.6 |
| All ages..... | 1,567 | 10.7 | 3,826 | 16.3 | 5,393 | 14.6 |
| Nonparalytic cases | | | | | | |
| 0-4..... | 178 | 24.7 | 792 | 35.5 | 970 | 33.5 |
| 5-9..... | 246 | 50.0 | 1,063 | 58.7 | 1,309 | 57.1 |
| 10-14..... | 139 | 28.8 | 658 | 42.4 | 797 | 40.0 |
| 15-19..... | 84 | 7.1 | 411 | 15.8 | 495 | 14.3 |
| 0-19..... | 647 | 32.9 | 2,924 | 42.7 | 3,571 | 40.9 |
| 20 and over..... | 252 | 1.6 | 1,070 | 9.1 | 1,322 | 7.6 |
| All ages..... | 899 | 24.1 | 3,994 | 33.7 | 4,893 | 31.9 |

¹ Based on preliminary and incomplete data from 45 States. A total of 1,107 cases, representing 10 percent of the total reported cases in these States, are excluded because one or more of the following were reported as

unknown: paralytic status, vaccination history, month of onset, or age.

² Cases with one or more inoculations prior to onset are classified as vaccinated.

alytic poliomyelitis than are used in the routine reporting of the disease. For this reason it is not possible to compare directly these triple-vaccinated cases with other groups of paralytic cases, vaccinated or unvaccinated.

Laboratory specimens have been collected on 16 of the 19 confirmed paralytic cases. Poliovirus was isolated from 7, other virus from 2, and no virus from 3. Final laboratory results have not yet been submitted on the four remaining cases. Thus, to date, seven triple-vaccinated paralytic cases have received laboratory confirmation.

Three deaths from poliomyelitis have been reported in triple-vaccinated persons. One case was established as bulbar poliomyelitis, but a recheck of vaccination records revealed that the child had never been vaccinated. A second case was clinically consistent with poliomyelitis, but pathological review revealed instead the anatomic findings of acute disseminated encephalo-

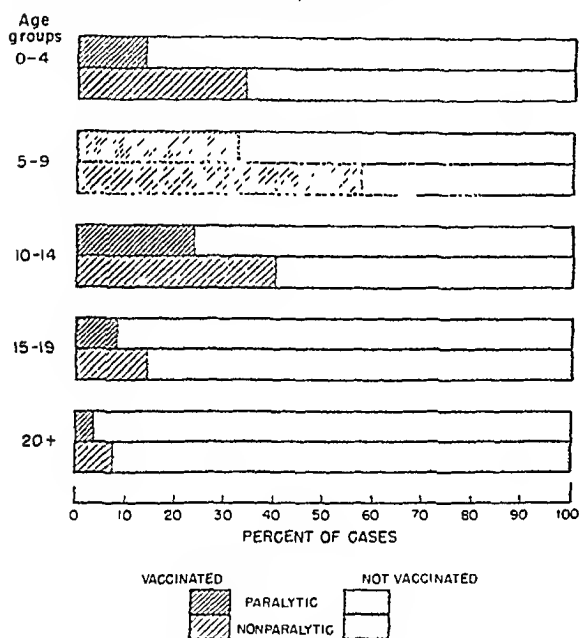
myelitis. The one remaining fatal case occurred in a 5-year-old boy who died the day after onset of fever and within 30 minutes of hospitalization. Findings of an autopsy performed without examination of the brain or spinal cord were reported as compatible with poliomyelitis. This is the only fatal case now being carried in the registry.

Vaccine Under Epidemic Conditions

There has been particular interest in evaluation of the effectiveness and possible dangers of administering poliomyelitis vaccine during epidemics. In particular, based on previous studies with diphtheria and pertussis antigens, it had been feared that the vaccine might "provoke" the development of subsequent paralysis in persons infected at the time of, or shortly after, vaccination. The first study of this problem was conducted during a small outbreak of poliomyelitis among U. S. Navy personnel and

figures and vaccine usage figures (particularly for commercial supplies of vaccine) were necessarily estimates. Variations in geographic and age-specific vaccination rates and attack rates could not be completely accounted for. Risk of exposure was assumed to be equal in the two populations and constant throughout the study period. Although attempts have been made to minimize the effect of these sources of error, interpretations of the results must necessarily be guarded.

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Preliminary results of these studies are summarized in table 7. In each State, paralytic attack rates were significantly lower among vaccinated persons than among unvaccinated persons. Each of these independent studies indicates an overall vaccine effectiveness in preventing paralytic poliomyelitis of about 75 percent. These results are in general agreement with results of similar analyses conducted in 1955 (1).

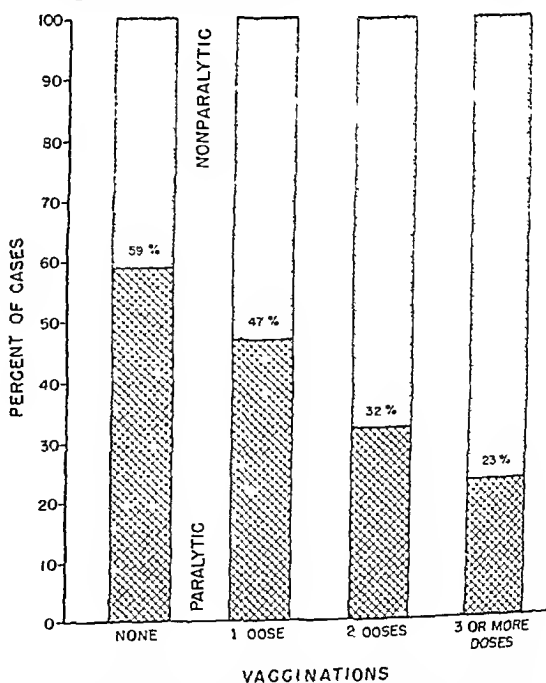
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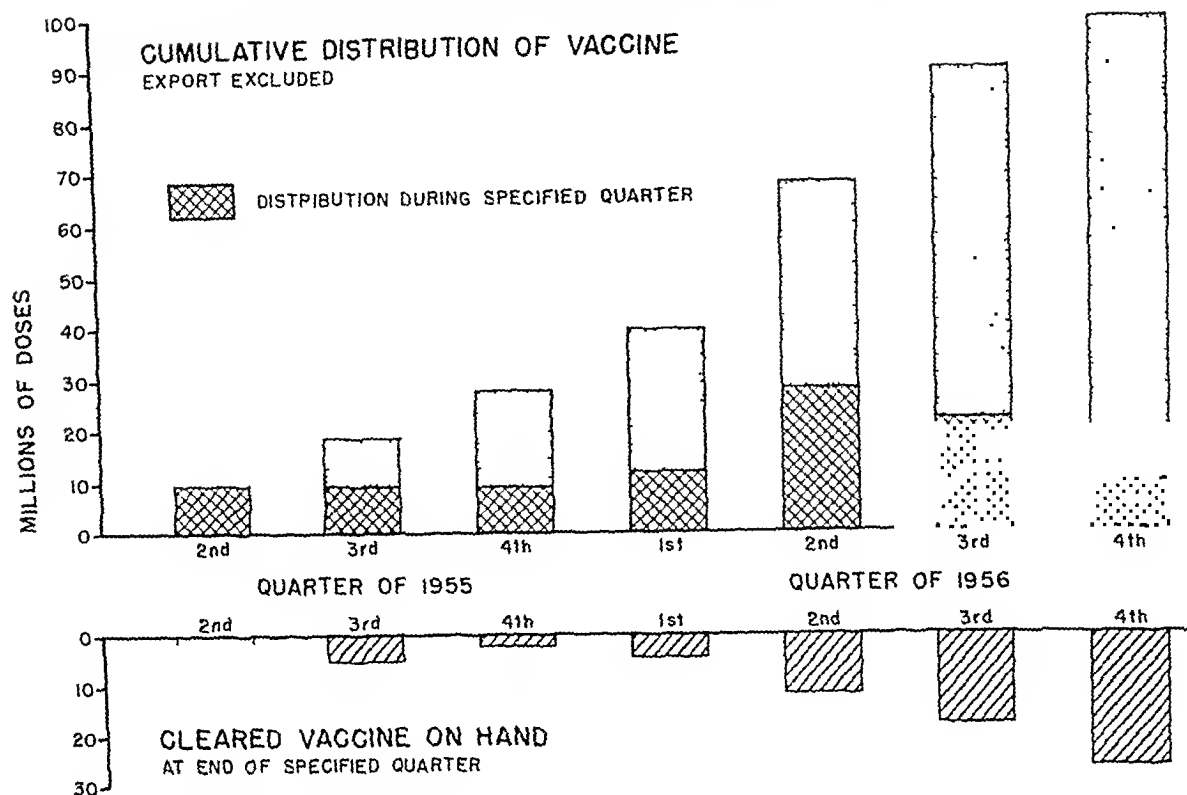
More stringent criteria have been applied in establishing these triple-vaccinated cases as par-

Figure 6. Frequency of paralysis in hospitalized cases of poliomyelitis, by vaccination history, Aug. 15-Sept. 30, 1956.



NOTE: Data from a survey by the National Foundation for Infantile Paralysis.

Figure 7. Distribution of poliomyelitis vaccine, 1955-56.



NOTE: Data from Poliomyelitis Vaccine Activity, Bureau of State Services, Public Health Service

A more complete presentation of findings in Chicago during 1956 will be published under the direction of Dr. Herman N. Bundesen, president, Chicago Board of Health.

Vaccine Distribution

During 1955 and 1956 a total of 98.2 million doses of poliomyelitis vaccine were distributed for domestic use, including 27.7 million doses from April through December 1955 and 70.5 million doses in 1956. An additional 6.5 million doses were exported during recent months of 1956. Through the end of 1956, a cumulative total of 130.6 million doses of vaccine (net cubic centimeters of bottled vaccine) had been released after clearance by the National Institutes of Health, Public Health Service, leaving a balance of 25.9 million doses on hand at the close of the year.

Distribution of vaccine by calendar quarters is presented in figure 7. Quarterly shipments of vaccine reached a peak in the second quarter of 1956, when 27.8 million doses were distrib-

uted. Shipments declined progressively during the last two quarters of 1956, lagging considerably behind vaccine releases. This progressive accumulation of vaccine available for use is also shown in figure 7.

Of the 98.2 million doses distributed domestically, 13.7 million were purchased by the National Foundation for Infantile Paralysis, primarily for vaccination of first- and second-grade school children in 1955, 53.5 million were distributed through public agencies, and 31.0 million were distributed through normal drug channels. Specific usage by age group and by first, second, or third inoculation for only a part of this vaccine is known.

There are between 60 and 65 million persons under 20 years of age in the United States and Territories. Just over half enough vaccine has now been distributed to complete three inoculations for each individual in this group. More than 100 million doses in addition would be required to complete vaccination of the population aged 20 to 40.

dependents in Hawaii in late 1955 (2). This analysis revealed no evidence of a "provoking" effect.

In 1956 the largest concentration of poliomyelitis occurred in Chicago, where more than 1,100 cases were reported. This outbreak presented an unusual opportunity for the study of mass vaccination under epidemic conditions. In collaboration with the Chicago Board of Health, the Cook County Health Department, the Illinois Department of Public Health, the division of services for crippled children of the University of Illinois, and the National Foundation for Infantile Paralysis, the Public Health Service undertook an epidemiological, clinical, and

Table 7. Results of three studies of vaccine effectiveness, 1956

| Item | California, ¹ June 1- Aug. 31 (ages 0-14 years) | Florida, ² June 1- Aug. 31 (ages 0-19 years) | Minnesota, ³ Aug. 1- Oct. 31 (ages 0-19 years) |
|--|---|--|--|
| Estimated person-months at risk (hundred thousands): | | | |
| Vaccinated..... | 96.66 | 4.35 | 20.86 |
| Not vaccinated..... | 99.66 | 8.19 | 13.06 |
| Paralytic cases: | | | |
| Vaccinated..... | 111 | 5 | 8 |
| Not vaccinated..... | 398 | 38 | 24 |
| Paralytic rates (per 100,- 000 population): | | | |
| Vaccinated..... | 1.2 | 1.1 | .4 |
| Not vaccinated..... | 4.0 | 4.6 | 1.8 |
| Estimated effectiveness (percent) ⁴ | 71 | 75 | 79 |
| Lower limit of effective- ness (percent) ⁵ | 66 | 44 | 57 |

¹ Data reported by Drs. A. C. Hollister, Jr., and R. L. Magoffin, bureau of acute communicable diseases, California Department of Public Health, and by Drs. G. L. Caplan and M. L. Wyman, epidemic intelligence service officers, assigned to the California Department of Public Health.

² Data reported by Drs. J. O. Bond and W. T. Sowder, Florida State Board of Health.

³ Data reported by Drs. H. Kleinman and C. S. Fleming, division of disease control and prevention, Minnesota Department of Health.

⁴ Difference between unvaccinated and vaccinated rates, divided by unvaccinated rate. Vaccine effectiveness thus expresses the percent reduction in the vaccinated attack rate as compared with the unvaccinated rate. Presumably, this reduction is due largely to the vaccine.

⁵ Calculated at the 95 percent confidence level according to the method used by Francis and associates (reference 3, appendix, p. 62).

laboratory study of poliomyelitis cases occurring in Chicago and suburban Cook County.

Preliminary analysis of epidemiological data showed patterns differing markedly from previous years, particularly the last previous epidemic year of 1952. In 1952 cases were scattered quite evenly throughout the city. In 1956 early cases were also scattered widely, indicating a general dissemination of the virus. However, as the outbreak progressed, high rates developed only in those areas of the city characterized by a particularly dense population, a low socioeconomic status, and a high proportion of nonwhites. In 1952 cases among nonwhites constituted 14 percent of the total cases as compared with 61 percent in 1956. In 1956 there was a shift in the age distribution of cases toward the preschool age group. This shift was particularly marked for the cases in the white population.

Preliminary analysis of clinical and laboratory data has revealed no unusual findings. About 60 percent of the cases were reported as paralytic. Stool specimens obtained from a large number of cases and examined by the laboratories of the Illinois Department of Public Health yielded predominantly type 1 poliovirus.

In late July 1956, during a period of rapidly rising incidence, the Chicago Board of Health initiated a large-scale mass vaccination program. Through the cooperative efforts of medical and other organizations in the city, more than 1.5 million doses were administered in less than 2 months. However, this program began too late to demonstrate any dramatic effect upon the epidemic curve.

In an attempt to delineate any possible "provoking" effect following this large number of inoculations, a preliminary analysis of about 400 vaccinated cases (including more than 300 cases occurring within 30 days of inoculation) was made. This analysis revealed no evidence that prior inoculation influenced the localization of subsequent paralysis. Among paralytic cases, there were 11 with initial involvement of the inoculated limb, 11 with initial involvement of the opposite uninoculated limb, and 13 with involvement of both the inoculated limb and the opposite uninoculated limb.

Poliomyelitis Vaccination Program in Richland, Wash.

By DAVID B. ROWLETT, M.D., and CAESAR BRANCHINI, M.A.

IN RICHLAND, WASH., a community of 26,000 population, statistical evaluation of the status of poliomyelitis vaccination, followed by the education of private physicians and co-operation between these physicians and the Richland Health Department, increased the percentage of vaccinated children in the survey from about 56 percent to 80 percent. The term "vaccinated" as used in this paper refers to those children who have received at least one shot of Salk vaccine. Although we realize that one shot confers neither complete nor lasting protection, we assume that children who have received one shot will complete the series.

In the event that other communities attempt to determine their poliomyelitis vaccination status, the statistics obtained in this study may serve as a base point for comparison with their findings.

Setting the Stage

A balance in supply of and demand for the Salk vaccine was not achieved in Richland until the early spring of 1956. During 1955 the vaccine was available in adequate supply but there was no demand for it. Early in 1956, due to the change in public opinion regarding the safety and effectiveness of the vaccine, the demand was rapidly accelerated and the supply fell short. Private physicians developed waiting lists of hundreds of patients who were patiently awaiting the arrival of more vaccine.

Dr. Rowlett is public health officer and industrial physician, and Mr. Branchini is a specialist in health education, Hanford Atomic Products Operation, General Electric Company, Richland, Wash.

The situation was eased about the middle of March. Between March and October 1956 the Richland Health Department, the National Foundation for Infantile Paralysis, and private physicians recommended the Salk vaccine and gave widespread but low-pressure publicity to its safety and effectiveness. The usual methods of dissemination of information were used. Leaflets were distributed through the schools and through the Hanford Atomic Products Operation plant, the chief industry in the Richland area. Newspaper stories were released recommending vaccination and reporting the amount of vaccine available. Radio and television announcements supplemented the information program.

Between March and October 1956 vaccinations were given by private physicians in their offices. When Government-purchased vaccine became available, it, too, was distributed to private physicians for office use. During this period, no clinics were held and no vaccinations were administered by the health department.

Continuous checks showed that the demand for the vaccine exceeded the supply. However, this situation began to reverse itself during September.

Health Department Study

It was at this point that the Public Health Operation of the General Electric Company's Hanford plant (local nomenclature for the Richland Health Department), which operates all Richland municipal facilities for the Atomic Energy Commission, undertook a study to de-

Discussion and Summary

The experience in the United States during 1956 shows that poliomyelitis vaccine has been safe and effective. Several hundred cases of poliomyelitis occurred shortly after inoculation, but this many vaccine-associated cases could easily be coincidental in view of the more than 70 million doses of vaccine that were administered. The vaccine-associated cases had all the characteristics of naturally occurring poliomyelitis. There was slight, if any, evidence of untoward reactions from the vaccine. While the concepts of absolute vaccine safety or total absence of a provoking effect of inoculation are not scientifically tenable, the epidemiological observations during 1956 indicated that any such hypothetical effects occurred at a frequency of less than one per million inoculations.

During 1956 the effectiveness of the vaccine could not be evaluated in well-controlled field studies, such as Francis conducted in 1954 (3), or in large-scale comparison-group studies such as were made in 1955 (1). It was necessary to depend largely upon qualitative studies and upon orderly epidemiological inferences based on careful observation and analysis. A number of independent studies consistently point to a level of effectiveness in preventing paralytic cases of 75 percent, with a large proportion of the vaccinated population having received less than the recommended course of three doses. The effectiveness of three doses, properly spaced, has not yet been fully evaluated, but the occurrence of several well-confirmed triple-vaccinated paralytic cases shows it to be less than 100 percent.

Considerable evidence has accumulated to show that the present vaccine is less effective in preventing nonparalytic cases and in controlling the spread of inapparent infection. Two published studies (4, 5), as well as unpublished work of Lipson, Carver, and Robbins and of Davis and Melnick, have shown that

vaccinated children in household contact with poliomyelitis cases can readily become infected, although, again, the effect of three doses has not yet been fully evaluated. Thus the primary effect of vaccine appears to be the prevention of invasion of the central nervous system and thereby the prevention of paralysis. This limitation on the effectiveness of the vaccine may be associated with the evidence that poliovirus did spread rather extensively in various populations during 1956, not only in Chicago, but in Louisiana, Utah, Idaho, California, and elsewhere. In spite of relatively widespread, but incomplete, vaccination, these populations experienced high incidence of disease, particularly among preschool children in all socioeconomic groups.

The immediate public health implication of the experience in 1956 is that substantially higher levels of immunity must be achieved among all elements of the population.

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cination series, was 44 percent. This proportion, however, varied considerably, from a low of 29.1 percent for third grade children to a high of 76.2 percent for senior high school children. The percentage of unvaccinated children in each school grade is shown in figure 2.

Vaccination Program

When the information on the vaccination status of the school children of Richland was tallied, it was decided that, although the level of protection achieved against poliomyelitis was high, it would be desirable to increase this level considerably for two reasons: (a) those who by this time had not taken advantage of the opportunity to obtain this protection would not do so voluntarily or, if they did, they would do so only in small numbers; and (b) the level of protection in the junior and senior high schools was so inadequate that considerable emphasis needed to be placed on these groups.

A vaccination program was proposed by the health officer of Richland. The plan was discussed with and approved by the local physicians, and the program was undertaken in the schools. Vaccinations were scheduled to be given during the last 2 weeks in October and the last 2 weeks in November 1956. Three groups of children were to receive shots of Salk vaccine:

Figure 1. Percentage of children in Richland, Wash., who received the designated number of shots of Salk vaccine in 1956, by school group, prior to the vaccination program.

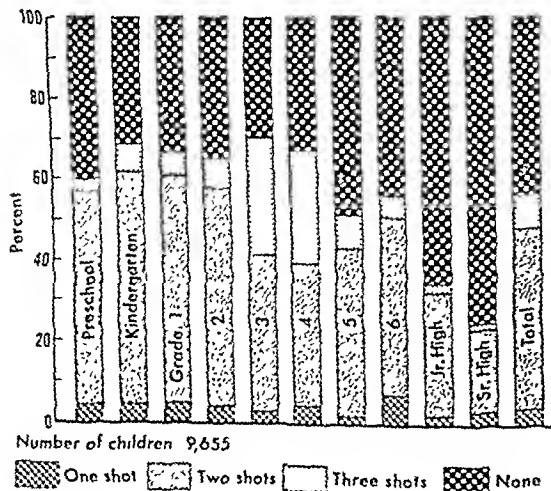
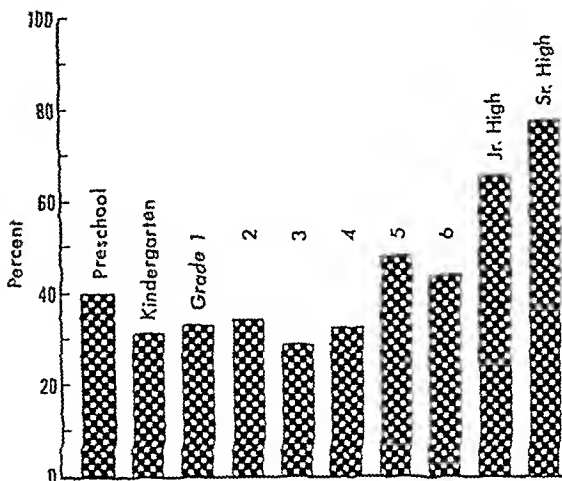


Figure 2. Percentage of children in Richland, Wash., who did not receive Salk vaccine in 1956, by school group, prior to the vaccination program.



1. Children who had received no previous shots would be given one shot in October and a second shot in November.

2. Children who had received only one shot, if it was given from 2 weeks to 6 months before either vaccination period, would be given their second shot during the October or November immunization schedule.

3. Children who had received two shots 7 months or more before October 1956 would be given their third shot during either of the vaccination periods.

In the secondary schools public health nurses discussed the safety and effectiveness of the vaccine in meetings with the students. The National Foundation for Infantile Paralysis film "Unconditional Surrender" was shown to all students, and a 15-minute television program was devoted to a discussion of the need for immunization among secondary school students.

The first half of the poliomyelitis vaccination program in the Richland schools was completed in November. Of the total population of school age and under, 80 percent have received at least one shot in the Salk vaccine series. The level of vaccinated children in the high school is 61 percent. Of the junior high school group, 80 percent have received at least one shot of vaccine; of the elementary school pupils, 87 percent.

termine the vaccination status of the children of the community. Children of school age and under comprise 42.2 percent of the total population of Richland.

The object of the study was to provide information on the current level of protection against poliomyelitis to help the health department decide whether a change in the vaccination program was needed. The study would also provide basic information from which to determine the effectiveness of the vaccination program and, later, the effectiveness of the vaccinations.

Study Methods

Two groups of children were studied and each group had to be treated differently. The first group was made up of school children. These children were easily reached through our regular school health program, since the public health nurses provide school health services in the community. The second group was made up of preschool children, and information on this group was more difficult to obtain.

A form which explained the advisability of vaccination against poliomyelitis and pointed out the safety and effectiveness of the Salk vaccine was prepared and was given each school child to take home. On the form parents were asked to indicate the number and approximate dates of shots of Salk vaccine received by each child and were offered the opportunity to continue the vaccination program with their private physicians. They were also requested to sign an attached slip if they were interested in administration of the vaccine by the health department.

At each school the public health nurse distributed the forms to the teachers. As is done routinely in other immunization programs, the teachers distributed the forms to the children and collected them when they were returned. The public health nurse collected the completed forms and delivered them to the health department, where the information was consolidated.

A sampling technique was used to obtain details of the vaccination histories of preschool children. In order to reduce the size of the sample, birth certificates of children born during 1952-56 were used to select the sample. To

Poliomyelitis vaccination status of children in Richland, Wash., as of October 1956

| Grade | Number shots of Salk vaccine received | | | | Total children in program |
|-------------------------|---------------------------------------|-----|-------|-----|---------------------------|
| | 0 | 1 | 2 | 3 | |
| Preschool..... | 1,300 | 150 | 1,700 | 100 | 3,250 |
| Kindergarten..... | 202 | 31 | 386 | 50 | 669 |
| 1..... | 239 | 29 | 403 | 41 | 712 |
| 2..... | 236 | 25 | 367 | 56 | 684 |
| 3..... | 201 | 12 | 280 | 198 | 691 |
| 4..... | 201 | 23 | 227 | 171 | 622 |
| 5..... | 277 | 12 | 243 | 45 | 577 |
| 6..... | 187 | 32 | 188 | 22 | 429 |
| Junior high school..... | 838 | 30 | 401 | 30 | 1,299 |
| Senior high school..... | 550 | 20 | 151 | 1 | 722 |
| Total..... | 4,231 | 364 | 4,346 | 714 | 9,655 |

assure anonymity, only the child's address was used, and a letter was mailed to the resident at that address. The letter explained the program and the fact that in order to plan a poliomyelitis vaccination program, information was needed on the vaccination history of all children in the community. Respondents were asked to indicate on an enclosed card the ages of preschool children in the household and the approximate dates when they had received Salk vaccine shots.

The information on the sample of preschool children was combined with the information on school children.

Findings

Information was obtained on 9,655 of the 10,977 children in the preschool and school age groups. The immunization status of the children in the study is shown in the table. Figure 1 shows the percentage of children in each grade who received the designated numbers of shots of Salk vaccine.

Our chief objective was to determine which children had not been vaccinated, in order that we might take steps to achieve a higher degree of protection against poliomyelitis if the collected data indicated a need for greater protection.

The proportion of children who had not been vaccinated, that is, who had not received any shots of Salk vaccine in the poliomyelitis vac-

use of general hospitals

Demographic

and

Ecologic

Factors

MAURICE E. ODOROFF, M.A.

LESLIE MORGAN ABBE, B.S.

Drawn from data compiled in a national household survey, this report gives provisional findings on current levels of general hospital use in relation to personal and geographic characteristics.

PLANNING for general hospitals has included a continuing search for valid standards of need. In 1947 uniform standards for the number of beds needed came into general use with the development of statewide hospital plans under the Hospital Survey and Construction (Hill-Burton) Act. These standards reflected the consensus of judgment of the period. They were largely lacking a base of actual experience in the needs of a population whose characteristics were known (1). During the subsequent decade the Nation's general hospital plant has increased by one-fourth, or more than 150,000 beds. At the same time changing techniques in the care and prevention of disease and illness have modified requirements for the physical facilities to insure adequate care. It is now essential to reassess these requirements.

Mr. Odoroff is chief, and Mr. Abbe is assistant chief, Program Evaluation and Reports Branch, Division of Hospital and Medical Facilities, Public Health Service.

As a first step in defining more precisely standards of need for general hospitals, the Public Health Service, through its Division of Hospital and Medical Facilities, has contracted for a survey of the present level of use of general hospitals. The data on use have been matched with data on personal characteristics and geographic and economic factors. Such a study permits identifying the circumstances which accompany varying levels of use and points the way to more intensive studies of real need. It achieves a link with the population served that cannot be had through studies of hospital records alone, since these records cover only those who choose to use the hospital.

Description of Study

The study of general hospital use is based on a sample household survey on a national scale. It was conducted by the Bureau of the Census through supplemental questions asked in its regular monthly current population survey.

These percentages are based on the assumption that all of those who have not responded to the questionnaire have not received any shots.

Summary

A study to determine the poliomyelitis vaccination status of all children of school age and

under was carried out in 1956 in Richland, Wash., a community of 26,000 population. Through the close cooperation of private physicians and the health department, 80 percent of the children in the age groups studied received Salk vaccine.

Cost Study of Poliomyelitis Vaccine Injections

A time and cost study in the Tri-County, Colorado. District Health Department found that the average cost of administering poliomyelitis vaccine in public poliomyelitis vaccination clinics of that department in 1956 was 26.5 cents for each injection, not including vaccine cost. The study was carried out by the staff of the Region 8 office of the Public Health Service in Denver.

The Tri-County District Health Department, directed by William S. Haynes, M.D., M.P.H., has jurisdiction over the three counties surrounding Denver—Adams, Arapahoe, and Jefferson. The vaccination clinics were held principally in the department's branch health centers in each county.

There were 112 clinic sessions in which 50,585 injections were given. The total cost of the clinics in 1956 was \$13,425.23, consisting of \$5,856.54 direct costs, \$4,037.19 nursing costs, and \$3,531.50 health department general overhead costs.

Direct costs cover expenditures for specialized poliomyelitis vaccine clinic supplies and equipment, fees to physicians (on an hourly rate) for administration of the vaccine, salaries of part-time clinic nurses, and salary of a clerk working exclusively with the poliomyelitis vaccination program. The vaccine, which was furnished by the Colorado Department of Public Health, was purchased with Federal grant-in-aid funds available to Colorado under the Poliomyelitis Vaccination Assistance Act of 1955.

The nursing cost item includes the cost of nursing services furnished by the visiting nurse services of the Tri-County Department to the public clinic program. It covers a part of the health department overhead costs allocated to the nursing service and the salary value of productive work by students in the clinics.

The pro rata share of health department overhead costs covers an allocation of these costs on a dollar pro rata basis computed on direct costs against overhead costs, excluding those allocated to nursing.

The overhead costs include the salary and travel costs of the health officer, clerks, and administrative staff; capital outlay; janitor and office supplies; medical and clinical supplies; building maintenance; telephone; postage; printing; estimated rental value of space used in publicly owned buildings; per diem payments to board of health members; and attorney fees.

"Housewife" volunteers devoted about 1,000 hours of service to the program. This service, if valued at \$1 per hour, would raise the cost of each injection by 2 cents.

use of general hospitals

Demographic

and

Ecologic

Factors

MAURICE E. ODOROFF, M.A.

LESLIE MORGAN ABBE, B.S.

Drawn from data compiled in a national household survey, this report gives provisional findings on current levels of general hospital use in relation to personal and geographic characteristics.

PLANNING for general hospitals has included a continuing search for valid standards of need. In 1947 uniform standards for the number of beds needed came into general use with the development of statewide hospital plans under the Hospital Survey and Construction (Hill-Burton) Act. These standards reflected the consensus of judgment of the period. They were largely lacking a base of actual experience in the needs of a population whose characteristics were known (1). During the subsequent decade the Nation's general hospital plant has increased by one-fourth, or more than 150,000 beds. At the same time changing techniques in the care and prevention of disease and illness have modified requirements for the physical facilities to insure adequate care. It is now essential to reassess these requirements.

Mr. Odoroff is chief, and Mr. Abbe is assistant chief, Program Evaluation and Reports Branch, Division of Hospital and Medical Facilities, Public Health Service.

As a first step in defining more precisely standards of need for general hospitals, the Public Health Service, through its Division of Hospital and Medical Facilities, has contracted for a survey of the present level of use of general hospitals. The data on use have been matched with data on personal characteristics and geographic and economic factors. Such a study permits identifying the circumstances which accompany varying levels of use and points the way to more intensive studies of real need. It achieves a link with the population served that cannot be had through studies of hospital records alone, since these records cover only those who choose to use the hospital.

Description of Study

The study of general hospital use is based on a sample household survey on a national scale. It was conducted by the Bureau of the Census through supplemental questions asked in its regular monthly current population survey.

This survey provides official Government statistics on total employment and unemployment, as well as periodic data on many other social and economic characteristics of the population (2, 3). The sample used in the survey of hospital use was drawn from the civilian, noninstitutional population living within the continental United States. It did not include members of the armed services or inmates of penal and mental institutions or of homes for the aged, infirm, and needy. It includes about 27,000 households (three-fourths of the regular sample size of the current population survey), consisting of about 90,000 persons of all ages. The sample was spread over 330 areas comprising 638 counties and independent cities, with coverage in each of the 48 States and the District of Columbia. The survey was made in September 1956 after a pretest in Philadelphia in June 1956, which included about 650 households and 2,100 persons.

For each family a history was obtained of hospitalization and outpatient care received by each of its members during the previous 12-month period. The questions asked sought to learn how frequently, how long, for what conditions, and in what hospitals or related facilities such care was obtained. Personal characteristics, such as residence address, sex and race, age, veteran status, and occupation, were identified through the standard inquiries of the regular monthly current population survey.

In addition, economic data were obtained for each household, showing income level, status with respect to hospital insurance coverage, and methods of payment for hospital care received. Particular attention was given to determining the place of care with respect to the type of place of residence (metropolitan, urban, or rural) of the patient. Throughout the study the terminology used follows standard definitions of the Bureau of the Census (4).

Certain limitations of the data must be noted. Institutional population is excluded for practical reasons arising from the method of survey. Also, any approach to reporting by household survey for a 12-month prior period of time fails to include a record of persons who used hospital care during the past year, but who died, emi-

grated, or entered the armed services before the survey date.

The figures reported are estimates based on a sample. Accordingly, they may differ somewhat from the figures that would have been obtained if a complete census had been taken, using the same questions, instructions, and enumerators. Sampling variability may be relatively large when the estimates and differences between estimates are small. The degree of variability will be calculated for selected items according to standard statistical procedures. As in any survey work, the results are subject to errors of response and reporting.

Scope of the Report

Because of the general interest indicated by a number of national groups and others, this report is published as an interim account of results before all data have been tabulated or analyzed. The data appearing are selected highlights. They relate only to levels of hospital use matched against personal characteristics and geographic circumstances of residence and place of care. They will need further study and analysis in relation to other data of the survey. Additional interim reports will cover (a) limited data on outpatient visits and the accompanying circumstances, (b) income of all families and individuals in the

Table 1. General hospital use, by sex and race

| Race | Both sexes | Male | Female |
|--|------------|------|--------|
| Annual admissions per 1,000 population | | | |
| All persons----- | 101 | 76 | 124 |
| White----- | 104 | 79 | 128 |
| Nonwhite----- | 72 | 49 | 93 |
| Average stay per admission, in days | | | |
| All persons----- | 8.1 | 10.1 | 6.8 |
| White----- | 8.0 | 9.9 | 6.8 |
| Nonwhite----- | 9.1 | 12.6 | 7.3 |

Table 2. General hospital use, by age

| Age groups, in years | Annual admissions per 1,000 population | Average stay per admission, in days |
|----------------------|--|-------------------------------------|
| All ages..... | 101 | 8.1 |
| Under 14..... | 54 | 5.2 |
| 14-24..... | 119 | 5.5 |
| 25-34..... | 162 | 6.1 |
| 35-44..... | 109 | 8.4 |
| 45-54..... | 93 | 9.9 |
| 55-64..... | 104 | 12.8 |
| 65 and over..... | 125 | 14.0 |

sample in relation to their levels of general hospital use, and (c) the proportion of hospital insurance coverage reported for all persons in the sample, matched with various personal, geographic, and economic circumstances. It is planned to publish a comprehensive report of the study as a monograph.

Two basic measures of the level of hospital use in varying circumstances have been compiled from the survey data. These are annual admissions per 1,000 population and average stay in days per admission. In this report, these two measures describe the relation between hospital use and a group of personal characteristics that may be considered demographic factors. They also describe the relation between use and a group of factors pertaining to the nature of the geographic and

Table 3. General hospital use among males 14 years old and over, by veteran status and type of hospital

| Veteran status and type of hospital | Annual admissions per 1,000 population | Average stay per admission, in days |
|--------------------------------------|--|-------------------------------------|
| All males 14 years old and over..... | 83 | 11.7 |
| Veterans..... | 84 | 12.8 |
| World War II veterans..... | 80 | 11.9 |
| In Federal hospitals..... | 10 | 28.2 |
| In non-Federal hospitals..... | 70 | 9.5 |
| Other veterans..... | 90 | 14.3 |
| In Federal hospitals..... | 15 | 33.6 |
| In non-Federal hospitals..... | 75 | 10.4 |
| Nonveterans..... | 82 | 11.0 |

social setting of the place of residence and the place of care. For the purposes of this study, these factors are classed as ecologic factors.

Demographic Factors

Sex and race result in marked differences in general hospital use for the population surveyed (table 1).

Annual admissions per 1,000 population total 101 for all persons. For females the rate (including maternity cases) is about one-fourth higher; for males, about one-fourth lower. The rates for the nonwhite population of both sexes are substantially lower than those for white persons.

The average stay for all persons is 8.1 days, with differentials by sex about as great as for admissions, but in the opposite direction.

Table 4. General hospital use among persons 14 years old and over, by employment status and industry

| Employment status and industry | Annual admissions per 1,000 population | Average stay per admission, in days |
|--|--|-------------------------------------|
| All persons 14 years old and over..... | 120 | 8.6 |
| In labor force..... | 82 | 8.5 |
| Employed..... | 81 | 8.4 |
| Agriculture..... | 57 | 8.2 |
| Wage and salary workers..... | 56 | 10.2 |
| Self-employed workers..... | 56 | 8.4 |
| Unpaid family workers..... | 60 | 5.5 |
| Nonagricultural industries..... | 84 | 8.4 |
| Wage and salary workers..... | 84 | 8.5 |
| Mining ¹ | 138 | 7.8 |
| Construction..... | 68 | 8.5 |
| Manufacturing..... | 80 | 8.5 |
| Transportation, etc..... | 98 | 11.1 |
| Trade..... | 83 | 8.5 |
| Services..... | 85 | 7.6 |
| Private households..... | 57 | 8.9 |
| Professional services..... | 107 | 7.4 |
| Other services..... | 73 | 7.5 |
| Public administration..... | 91 | 8.6 |
| Self-employed workers..... | 84 | 8.1 |
| Unpaid family workers..... | 113 | 5.3 |
| Unemployed..... | 97 | 10.6 |
| Not in labor force..... | 174 | 8.7 |
| Keeping house..... | 199 | 6.4 |
| Going to school..... | 48 | 7.3 |
| Unable to work..... | 239 | 25.6 |
| Other nonworkers..... | 179 | 16.1 |

¹ Includes forestry and fisheries.

This survey provides official Government statistics on total employment and unemployment, as well as periodic data on many other social and economic characteristics of the population (2, 3). The sample used in the survey of hospital use was drawn from the civilian, noninstitutional population living within the continental United States. It did not include members of the armed services or inmates of penal and mental institutions or of homes for the aged, infirm, and needy. It includes about 27,000 households (three-fourths of the regular sample size of the current population survey), consisting of about 90,000 persons of all ages. The sample was spread over 330 areas comprising 638 counties and independent cities, with coverage in each of the 48 States and the District of Columbia. The survey was made in September 1956 after a pretest in Philadelphia in June 1956, which included about 650 households and 2,100 persons.

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grated, or entered the armed services before the survey date.

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Scope of the Report

Because of the general interest indicated by a number of national groups and others, this report is published as an interim account of results before all data have been tabulated or analyzed. The data appearing are selected highlights. They relate only to levels of hospital use matched against personal characteristics and geographic circumstances of residence and place of care. They will need further study and analysis in relation to other data of the survey. Additional interim reports will cover (a) limited data on outpatient visits and the accompanying circumstances, (b) income of all families and individuals in the

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| White..... | 8.0 | 9.9 | 6.8 |
| Nonwhite..... | 9.1 | 12.6 | 7.3 |

Table 6. General hospital use, by residence and place of care

| Residence | Place of care | | | | | | |
|--|---------------|--|----------------------|--------------------------|-------------------------|---------------------|------------------|
| | All places | Standard metropolitan areas ¹ | | | Urban (nonmetropolitan) | | Rural |
| | | Metropolitan area of residence | | Other metropolitan areas | Places 10,000-50,000 | Places under 10,000 | |
| | | Central city | Outside central city | | | | |
| Annual admissions per 1,000 population | | | | | | | |
| All areas..... | 100 | 39 | 12 | 11 | 20 | 14 | 5 |
| Metropolitan areas..... | 97 | 68 | 21 | 5 | 2 | 1 | (²) |
| Central city..... | 95 | 85 | 5 | 3 | 1 | 1 | (²) |
| Urban fringe..... | 95 | 46 | 41 | 5 | 2 | (²) | 1 |
| Rural nonfarm..... | 107 | 59 | 33 | 10 | 4 | 2 | (²) |
| Rural farm..... | 83 | 51 | 20 | 5 | 5 | 4 | (²) |
| Urban (nonmetropolitan)..... | 115 | ----- | ----- | 18 | 61 | 34 | 2 |
| Places 10,000-50,000..... | 117 | ----- | ----- | 18 | 93 | 4 | 2 |
| Places under 10,000..... | 113 | ----- | ----- | 18 | 23 | 69 | 3 |
| Rural (nonmetropolitan)..... | 100 | ----- | ----- | 18 | 34 | 30 | 18 |
| Nonfarm..... | 113 | ----- | ----- | 20 | 41 | 33 | 20 |
| Farm..... | 81 | ----- | ----- | 16 | 25 | 27 | 14 |
| Average stay per admission, in days | | | | | | | |
| All areas..... | 8. 1 | 9. 2 | 7. 5 | 11. 4 | 6. 6 | 6. 3 | 5. 4 |
| Metropolitan areas..... | 9. 1 | 9. 2 | 7. 4 | 12. 5 | 10. 5 | 6. 0 | 4. 9 |
| Central city..... | 10. 1 | 9. 9 | 9. 0 | 17. 6 | 11. 3 | 6. 9 | 4. 4 |
| Urban fringe..... | 8. 3 | 8. 3 | 7. 6 | 12. 0 | 13. 8 | 2. 9 | 5. 2 |
| Rural nonfarm..... | 7. 2 | 7. 5 | 6. 0 | 8. 4 | 8. 7 | 7. 2 | (²) |
| Rural farm..... | 6. 8 | 7. 8 | 6. 0 | 4. 6 | 3. 2 | 3. 9 | (²) |
| Urban (nonmetropolitan)..... | 6. 9 | ----- | ----- | 10. 9 | 6. 4 | 6. 0 | 5. 1 |
| Places 10,000-50,000..... | 7. 2 | ----- | ----- | 11. 8 | 6. 3 | 5. 4 | 7. 5 |
| Places under 10,000..... | 6. 7 | ----- | ----- | 9. 8 | 6. 5 | 6. 1 | 3. 5 |
| Rural (nonmetropolitan)..... | 7. 1 | ----- | ----- | 11. 1 | 6. 3 | 6. 5 | 5. 4 |
| Nonfarm..... | 6. 8 | ----- | ----- | 10. 3 | 6. 1 | 6. 3 | 6. 0 |
| Farm..... | 7. 5 | ----- | ----- | 12. 6 | 6. 9 | 6. 8 | 4. 2 |
| Median distance traveled per admission, in miles | | | | | | | |
| All areas..... | 7. 4 | 6. 2 | 6. 1 | 40. 1 | 7. 7 | 8. 6 | 8. 6 |
| Metropolitan areas..... | 6. 5 | 6. 2 | 6. 1 | 23. 6 | 21. 6 | 16. 9 | (²) |
| Central city..... | 5. 6 | 5. 4 | 6. 4 | 55. 0 | 9. 0 | (²) | (²) |
| Urban fringe..... | 6. 6 | 6. 8 | 5. 8 | 72. 3 | (²) | (²) | (²) |
| Rural nonfarm..... | 10. 1 | 12. 5 | 6. 6 | 17. 9 | 17. 5 | (²) | (²) |
| Rural farm..... | 11. 5 | 11. 7 | (²) | (²) | (²) | (²) | (²) |
| Urban (nonmetropolitan)..... | 6. 5 | ----- | ----- | 37. 2 | 5. 8 | 5. 8 | 15. 7 |
| Places 10,000-50,000..... | 5. 9 | ----- | ----- | 18. 4 | 5. 3 | 11. 9 | (²) |
| Places under 10,000..... | 7. 5 | ----- | ----- | 53. 8 | 11. 6 | 5. 6 | (²) |
| Rural (nonmetropolitan)..... | 13. 3 | ----- | ----- | 47. 2 | 10. 7 | 12. 7 | 8. 2 |
| Nonfarm..... | 10. 5 | ----- | ----- | 36. 5 | 9. 1 | 10. 8 | 7. 8 |
| Farm..... | 18. 1 | ----- | ----- | 59. 4 | 18. 1 | 15. 5 | 9. 2 |

¹ Includes a central city of at least 50,000 population with contiguous counties socially and economically integrated therewith, as defined by the Bureau of the Census (4).

² Insufficient number of cases to justify entry.

NOTE: Discrepancies in totals result from rounding.

Women are admitted more frequently than men, but stay a shorter time.

Age affects substantially the pattern of admissions and average stay in general hospitals (table 2).

For children under 14 years of age the admission rate of 54 per 1,000 population is only slightly more than one-half the rate for all ages. It rises steadily, by 10-year age groups, to a rate of 162 for ages 25-34 (the principal child-bearing age group). The rate then declines to 93 for the age group 45-54 and rises thereafter. For the group aged 65 and over, the rate for the sample study is 125 per 1,000 population.

Average hospital stay for the childhood group is reported at 5.2 days, rising gradually to a maximum of 14.0 days for persons 65 years and older.

Veteran status has little effect on admissions and average stay, according to the record for all males 14 years of age and older (table 3).

Veterans of World War II have an admis-

sion rate of 80 per 1,000 population and an average stay of about 12 days, in comparison with a rate for other veterans of 90 admissions and a stay of about 14 days.

Both groups of veterans are receiving care principally in non-Federal hospitals. The typical stay for veterans in Federal hospitals is from 4 to 5 weeks; it is about 10 days in non-Federal hospitals.

Employment status and industry produce substantial differences in admissions, with varying effect on average stay for specific industries and employment groups (table 4).

For all persons 14 years of age and over, annual admissions are at a rate of 120 per 1,000 population. For those in the labor force, the admission rate is 82. The rate drops to 57 for those in agriculture and rises to 97 for the unemployed group and 138 for persons in mining (including forestry and fisheries). For persons not in the labor force (homemakers, students, the disabled, and others), the combined admission rate is 174. Persons classified as unable to work have an admission rate of 239, with an average stay of 26 days.

Table 5. General hospital use, by region and type of residence

| Region | Type of residence | | | |
|---|------------------------|-------|--------------|------|
| | All resi- dences | Urban | Rural | |
| | | | Non- farm | Farm |
| Annual admissions per 1,000 population | | | | |
| All regions..... | 101 | 100 | 112 | 83 |
| Northeast..... | 96 | 94 | 106 | 80 |
| North Central..... | 99 | 98 | 109 | 87 |
| South..... | 102 | 107 | 112 | 77 |
| West..... | 111 | 103 | 130 | 111 |
| Average stay per admission, in days | | | | |
| All regions..... | 8.1 | 8.7 | 6.9 | 7.4 |
| Northeast..... | 9.7 | 10.5 | 7.5 | 8.6 |
| North Central..... | 8.1 | 8.6 | 6.7 | 8.7 |
| South..... | 7.0 | 7.2 | 7.0 | 6.6 |
| West..... | 7.5 | 8.1 | 6.6 | 5.8 |

Ecologic Factors

Geographic region and type of residence have a considerable effect on admissions and average stay (table 5).

Admissions of persons who live on farms are consistently lower than other admissions. Nationally, the admission rate for farm people is one-sixth less than for the total population. This differential holds for 3 of the 4 broad regions of the country. In each region, the highest level of admissions is for rural nonfarm residents.

Type of residence and place of care, as they reflect accessibility, materially affect levels of hospital use (table 6). To assist in interpreting this complex relation, a third measure has been introduced. Not only does the study identify the place of residence of the patient according to whether it is metropolitan, urban, or rural and compare levels of use for a related array of places of care, but it also identifies the median distance traveled for care from each type of residence to each type of place of care.

Particular effort has been made to discover

the total hospital admissions for this residence group. For rural parts of standard metropolitan areas, the admission rate to the central city is 59 for nonfarm residents and 51 for farm residents.

- Residents of urban nonmetropolitan communities have about 18 percent of their total admissions in a metropolitan area. A substantial proportion of admissions for persons living in smaller urban places (under 10,000 population) is in hospitals of larger communities.

- Residents of rural areas (that is, areas where all places are under 2,500 population) report that only 18 percent of their admissions are in hospitals located in rural areas; another 30 percent are in places under 10,000 population.

- The average stay of central city residents in metropolitan areas is greater than the stay of people who come from elsewhere in the area.

- Persons living outside of metropolitan areas report an average stay considerably below that of people who live in metropolitan areas, except when they go to a metropolitan area for care. Such stay for nonmetropolitan residents averages about 11 days in metropolitan hospitals, as compared with 6 days in hospitals nearer home.

- Farm residents cared for in rural hospitals report an average stay of only about 4 days.

- The median distance traveled by each group does not vary greatly from the national average of 7.4 miles, except for persons receiving care in a metropolitan area which is not their place of residence. Such travel amounts to 40 to 50 miles or more.

Reasons for admission in relation to place of care show relatively less diversity in level of use than do places of residence in relation to place of care (table 7).

Surgery accounts for 25 percent of all admissions, and obstetrics for 22 percent.

Average stay for surgery is 10.6 days and for accidents 12.1 days, as compared with about 5 days for obstetric and pediatric services and an average for all reasons of 8.1 days.

Summary

The Public Health Service is investigating the level of use of general hospitals by a known population, for which selected demographic, ecologic, and economic data are collected. For this purpose, the resources of the Bureau of the Census have been employed in connection with household interviews of its current population survey. The sample used comprises about 27,000 families, including about 90,000 persons of all ages, which is three-fourths of the current population survey sample. The study is intended as a first step in defining standards of need for general hospital beds by identifying the circumstances which accompany varying levels of use.

This interim report records provisional findings on levels of general hospital use in relation to (a) selected factors of personal characteristics of the population surveyed and (b) geographic factors pertaining to location and urban-rural residence of the patients cared for. It also reports on use according to the accessibility of the place of care, as related to the place of residence of the patient, and according to the reason for admission. Special significance attaches to the data describing the level of use provided within the central city of a metropolitan area for patients coming from its urban and rural fringe.

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- (2) U. S. Bureau of the Census: Concepts and methods used in the current labor force statistics prepared by the Bureau of the Census. Current Population Reports, series P-23, No. 2. Washington, D. C., 1954, 10 pp.
- (3) U. S. Bureau of the Census: Expansion of the current population survey sample: 1956. Current Population Reports, series P-23, No. 3. Washington, D. C., 1956, 8 pp.
- (4) U. S. Bureau of the Census: Census of population: 1950. Vol. II, pt. 1, United States summary: Introduction. Washington, D. C., U. S. Government Printing Office, 1953, pp. 1-66.

the present pattern of use in metropolitan areas, with respect to the large population groups now found in the fringe areas outside the central city. This is a secondary problem in broad planning for general hospital needs on which very little factual evidence has been available. The urban fringe includes both urban places and unincorporated urban areas.

This survey shows the following principal facts about the relation between place of residence and place of care in affecting levels of use:

- The total admission rate by residence varies from 81 for persons living on farms not in metropolitan areas to 117 for persons living in urban places below 50,000 population.

- The residents of metropolitan areas report an admission rate of 97. Persons living in rural nonfarm residences in metropolitan areas report a rate higher than the metropolitan area average, namely, 107. Residents of the urban fringe in metropolitan areas report an admission rate to the central city of only 46 per 1,000 population, or less than one-half of

Table 7. General hospital use, by reason for admission and place of care

| Reason for admission | Place of care | | | | | |
|--|---------------|---|----------------------------|------------------------------|---------------------------|-------|
| | All places | Standard metro- politan areas ¹ | | Urban (nonmetro- politan) | | Rural |
| | | Central city | Outside central city | Places 10,000- 50,000 | Places under 10,000 | |
| Annual admissions per 1,000 population | | | | | | |
| All reasons..... | 100 | 48 | 14 | 19 | 14 | 5 |
| Surgery..... | 25 | 13 | 3 | 5 | 3 | 1 |
| Obstetrics..... | 22 | 10 | 3 | 4 | 3 | 1 |
| Pediatrics..... | 16 | 8 | 2 | 3 | 2 | 1 |
| Accidents..... | 6 | 3 | 1 | 1 | 1 | (?) |
| Other..... | 32 | 14 | 4 | 7 | 5 | 2 |
| Average stay per admission, in days | | | | | | |
| All reasons..... | 8.1 | 9.6 | 7.5 | 6.6 | 6.3 | 5.4 |
| Surgery..... | 10.6 | 13.0 | 8.8 | 8.4 | 7.2 | 8.0 |
| Obstetrics..... | 4.5 | 4.8 | 4.7 | 4.2 | 4.0 | 4.0 |
| Pediatrics..... | 5.2 | 6.0 | 4.3 | 3.8 | 4.4 | 3.2 |
| Accidents..... | 12.1 | 15.3 | 10.9 | 8.4 | 9.3 | 4.1 |
| Other..... | 9.3 | 11.2 | 9.9 | 7.6 | 7.4 | 6.4 |
| Median distance traveled per admission, in miles | | | | | | |
| All reasons..... | 7.4 | 7.3 | 6.3 | 7.7 | 8.6 | 8.6 |
| Surgery..... | 7.8 | 8.1 | 6.4 | 8.1 | 8.9 | 6.7 |
| Obstetrics..... | 6.9 | 6.6 | 6.1 | 6.9 | 8.5 | 9.5 |
| Pediatrics..... | 7.2 | 7.3 | 6.1 | 7.1 | 8.3 | 7.7 |
| Accidents..... | 7.8 | 7.2 | 6.9 | 8.0 | 10.2 | 8.3 |
| Other..... | 7.5 | 7.2 | 6.3 | 8.1 | 8.4 | 9.2 |

¹ Includes a central city of at least 50,000 population with contiguous counties socially and economically integrated therewith, as defined by the Bureau of the Census (4).

² Insufficient number of cases to justify entry.

NOTE: Discrepancies in totals result from rounding.

Expenses and Income Sources of Dental Students

By SHAILER PETERSON, Ph.D., and WALTER J. PELTON, D.D.S., M.S.P.H.

THE NUMBER of dentists in active practice in the United States rose by almost 5,000 between 1930 and 1955. Despite this numerical gain, the supply of dentists in proportion to population continuously declined. In 1930, there was 1 dentist for every 1,728 persons in the Nation; by 1955, there was 1 dentist to 2,168 persons. A continuation of this adverse trend through the next 20 years will result in the most unfavorable dental manpower supply this country has had since the beginning of the century.

The failure of the dental manpower supply to keep up with population growth has occurred during a period in which dental schools have been training the largest numbers of students in their history. In the 10-year period between 1940 and 1950, enrollments increased by more than 50 percent, to reach an average of almost 12,000 students a year. Enrollments have continued to rise in each year since 1950 but not fast enough to reverse the pattern of shortage. They must be drastically increased to provide enough dentists to care for a larger population and to meet the rise in the level of individual demand for care which is expected to accompany population growth.

Dr. Peterson is secretary of the Council on Dental Education, American Dental Association. An authority on educational research and measurement in dental education, he has served as director of educational measurements of the council and was on the examination staff of the Armed Forces Institute at the University of Chicago. Dr. Pelton is chief of the Division of Dental Resources, Public Health Service, a position he has held since 1951.

The need for raising dental school enrollments poses some serious financial problems for the schools, for the students, and for dentistry as a whole. A study conducted in 1952 (1) revealed that dental schools had large backlogs of equipment and building needs which could not be met because of a lack of sufficient funds. Increases in tuition had done no more than keep pace with postwar inflation. A further rise in tuition would provide some relief for the schools, whose financial difficulties have been aggravated by expanding enrollments. Administrators, however, fear that substantial increases in tuition would inhibit enrollment, and therefore hesitate to place further financial obstacles in the way of qualified students.

That dental education is already a very expensive undertaking for the student is shown in a recently published study of the financial problems of dental students conducted by the Council on Dental Education of the American Dental Association and the Division of Dental Resources of the Public Health Service (2). This investigation, together with the earlier study on the financial status of the schools, provides a foundation for the planning of effective corrective measures which will alleviate the schools' financial problems. It can also serve as a guide in the reappraisal of tuition charges and the establishment of expanded scholarships and other programs of financial aid for students.

Survey Methods

In May 1954, the ADA Council on Dental Education, with the cooperation of dental



Miss Switzer



Dr. Dauer



Dr. Cohen



Dr. Top

New Members of the PHR Board of Editors

Four new members have joined the Board of Editors of *Public Health Reports*. Replacing Dr. Gaylord W. Anderson, Dr. Halbert L. Dunn, Dr. Martha M. Eliot, and Dr. Basil C. MacLean, the appointees will serve on the 13-member board for 3 years ending in 1959.

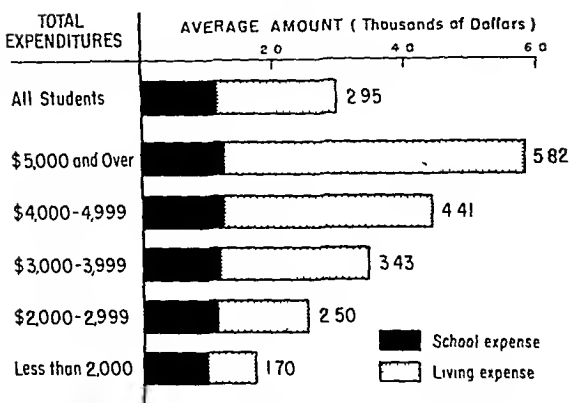
Mary E. Switzer, who became director of the Federal Office of Vocational Rehabilitation in 1950, was instrumental in developing the expanded vocational rehabilitation law passed unanimously by Congress in 1954. This legislation has united the public and private nonprofit restoration organizations with the States in attacking disability problems. Miss Switzer, long outstanding in her national and international health work, was presented with a distinguished service award by the Department of Health, Education, and Welfare in April 1956. Previously, she had received the National Rehabilitation Association President's Award. Miss Switzer has also been awarded the honorary degree of doctor of humane letters by Gallaudet College, District of Columbia, and Tufts University, Medford, Mass.

Carl C. Dauer, M.D., M.P.H., has been medical adviser to the National Office of Vital Statistics, Public Health Service, since 1950. He received his medical degree from Western University in 1920, and graduated from the Harvard School of Public Health in 1933. Dr. Dauer began his public health career as director of child hygiene with the Marion County Health Department, Salem, Oreg., in 1930. Subsequently, he served as an instructor and assistant professor in preventive medicine at Tulane University and as director of the bureau of preventable diseases, District of Columbia Department of Health. He has held teaching positions at the Catholic University, Georgetown University, and George Washington University Medical Schools. Dr. Dauer, whose contributions to medical literature have been extensive, is a member of the American Epidemiological Society, the Washington Academy of Sciences, the Public Health Service Psittacosis Board, a fellow in the Epidemiology Section of the American Public Health Association, and a diplomate of the American Board of Preventive Medicine.

Mandel E. Cohen, M.D., is on the staff of the Massachusetts General Hospital in Boston and of the department of neurology at the Harvard Medical School. Concurrently, he serves as consulting neuropsychiatrist for the Army, the Public Health Service, and Los Alamos Medical Center. A graduate of Johns Hopkins Medical School, Dr. Cohen received his training largely at the Boston City Hospital and the Massachusetts General Hospital. He was a member of the Department of Medicine and Psychiatry at the Harvard Medical School in 1945, and the following year joined the staff of Tufts Medical School as research professor of psychiatry. His published works include reports on studies of hysteria, neurocirculatory asthenia, epilepsy, manic-depressive disease, heart disease, and vascular disease of the brain.

Franklin H. Top, M.D., is a faculty member of the State University of Iowa, where, since 1952, he has been director of the department of health and head of hygiene and preventive medicine. In the same period, he has also acted as consulting director of the Iowa State Hygienic Laboratories, Iowa City, as well as consultant in infectious diseases at the hospital of the State University of Iowa. He is also director of the Institute of Agricultural Medicine, established in 1955. After graduation from the University of Pennsylvania Medical School in 1928 and the Johns Hopkins School of Hygiene and Public Health in 1935, Dr. Top began his professional career in the Herman Kiefer Hospital in Detroit, becoming hospital director in 1947. During the 2 years spent as professor of epidemiology and pediatrics at the University of Minnesota College of Medical Sciences, Dr. Top edited the *History of American Epidemiology* by C.-E. A. Winslow and associates, 1952. He is also the author of the standard work, *Communicable Diseases*, 1941, 1947, 1955.

Average expenditure of dental students, 1953-54.



and \$4,465, or 38 percent, was charged to school expense. Tuition and fees represented the largest item of school expense, accounting for more than half of the total. Next in importance came equipment and supplies, for which the average student spent almost a third of his school funds. Books accounted for less than 7 percent, and the remainder was spent on such items as fraternity dues and examination fees.

School expenses were rarely distributed evenly over the 4 college years. In the majority of reporting schools, expenditures reached their peak in the sophomore year and then declined; in many cases, school costs in the senior year were no more than half the amount recorded in the peak year. This uneven distribution was generally caused by the timing of major purchases of equipment and supplies. Some students substantially reduced total school expenses by renting, rather than purchasing, much of the needed equipment.

School costs in private schools were greater than those in public schools. Most of the difference was attributable to charges for tuition and fees, which were 45 percent higher in private colleges. In addition, the equipment, supply, and book bill was higher for the private school student.

There were also regional variations in the levels of school expenses. In the Northeast, where tuition and fees were highest, the student spent \$5,113 over 4 years. School expenses averaged \$1,812 in the West, where expenditures for tuition and fees were below the northeastern level, but equipment and supplies were

higher. Average expenditures were \$4,241 in the South and \$4,122 in the North Central States. Tuition and fees were slightly lower in the South than in the North Central States, but equipment and supplies cost more.

Living Costs

Since living expenses amounted to 62 percent of the average student's budget, they were much more important than school expenses in determining the total cost of a dental education. Within the framework of living costs, food and housing required the largest outlays, with food accounting for one-third and housing for one-fifth of all expenditures. Personal maintenance and recreation were other large items, constituting one-fourth of the budget. Health and medical care cost comparatively little, averaging about 3 percent for all students, and many of them failed to list it at all.

Unlike school expenses, living costs increased progressively throughout the 4 years. The upward trend resulted from a combination of gradually expanding expenditures by both married and single students and a progressively larger proportion of married students in each of the higher classes.

Living costs, like school costs, tended to be higher for private school students. The exception to this pattern appears to be the single

Table 1. Average 4-year expenditures of dental students, 1953-54

| Category of student and type of school | Number of students | Average expenditures | | |
|--|--------------------|----------------------|---------|---------|
| | | Total | School | Living |
| All students..... | 9,521 | \$11,814 | \$4,465 | \$7,349 |
| Private..... | 6,777 | 12,037 | 4,780 | 7,257 |
| Public..... | 2,744 | 11,262 | 3,682 | 7,580 |
| Married..... | 4,165 | 14,452 | 4,410 | 10,012 |
| Private..... | 2,771 | 14,923 | 4,761 | 10,162 |
| Public..... | 1,394 | 13,510 | 3,712 | 9,798 |
| Single, away from home..... | 3,825 | 10,311 | 4,428 | 5,913 |
| Private..... | 2,680 | 10,814 | 4,751 | 6,060 |
| Public..... | 1,145 | 9,237 | 3,660 | 5,577 |
| Single, at home..... | 1,531 | 8,295 | 4,697 | 3,598 |
| Private..... | 1,326 | 8,426 | 4,862 | 3,564 |
| Public..... | 205 | 7,418 | 3,633 | 3,815 |

school deans, distributed questionnaires to the 12,516 students enrolled in the country's 43 dental colleges. Students were asked to estimate their expenditures for the 1953-54 school year and to designate the source of funds used to meet these expenses. They were also asked to supply information regarding personal and family characteristics, types of living arrangements, and proposed sites of future practice.

Survey schedules were returned by all of the 26 privately financed schools and by 13 of the 17 publicly financed schools. Enrollments in these 39 colleges amounted to about 90 percent of the entire student body. Of the 4 nonreporting public schools, 2 were located on the Pacific coast and 2 in the North Central States. Schedules were completed by 87 percent of all private school students and 58 percent of all public school students, for a total participation of 76 percent. The data pertaining to the characteristics of students and to their financial problems are summarized here.

A Changing School Population

The present dental school population is in a phase of transition. The veteran enrollments marking the immediate postwar period are now on the decline, and as a result there has been a lowering of the average age level of dental students as well as a decrease in the number of married men among the student population.

Despite the downward trend in average age, today's students are still older than their prewar counterparts and are more likely to be married. They enter school with more predental education than their predecessors. The majority are from families whose annual incomes are well above the national average, and their fathers are likely to be in professional or managerial occupations.

The occupational background of parents and the level of family income apparently are factors influencing the choice of dentistry as a career. One in every nine students has a dentist father; nationally, 1 in every 500 men in the labor force is a dentist. Only about one-third of all dental students are from families with annual incomes of less than \$5,000, an income group represented by four-fifths of the families in the United States.

Among dental students from low-income families, the proportion of veterans, who are eligible for financial assistance under the GI bill, is relatively higher than the proportion of nonveterans. The GI bill has proved to be a patent factor in stimulating enrollments of qualified students from low-income groups.

Cost of Dental Education

In estimating expenditures for the 1953-54 academic year, dental students were asked to list both school and living expenses. School expenses included amounts spent either by the student or on his behalf for tuition and fees, textbooks, instruments, equipment and supplies, organization dues, and other related expenses. Living expenses covered sums paid for rent, food, clothing, recreation, personal maintenance, health services, travel, and miscellaneous expenses of the students and any dependents in their households. Students living with parents or friends listed only their out-of-pocket expenses for these items.

Annual expenses reported by the different categories of students in each of the four classes in school in 1953-54 were projected as 4-year totals in order to estimate the complete cost of a dental education.

A review of these estimates shows that the cost varies from student to student and from school to school. The differences in the levels of total expenditures are largely the result of variations in living expenses, which range over a wide scale of values while school expenses fluctuate only moderately. The highest average school costs reported by any category of students are only one-fourth greater than those at the lowest level, but the highest average living expenses are six times as great as those at the lowest level (see figure). The most striking differences in living expenses are those associated with marital status and living arrangements, factors having no appreciable effect on the levels of school expense (table 1).

School Expenses

For the student body as a whole, the average cost of 4 years in dental school was \$11,814. Of this amount, \$7,349 covered living expenses,

re accurate measure of the amount student pays for his education than average for all single students. His expenses averaged \$4,428 and were higher than those of the married student's living costs, which totaled \$5,913, percent less. Food bills were \$2,115, though this was far below the amount of the married student, it represented a share of total expenditures (36 percent). Housing was also cheaper, averaging 10 percent). He was able to devote a larger budget to personal maintenance and dividing nearly \$1,800 between the expenses for health and medical care and only \$77 for the 4 years.

Cost of education for the single student with his parents was \$8,295, the lowest recorded for any category of student. For this student alone, school expenses were higher than living costs. School expenses, which averaged \$4,697, were also higher than those of other students, primarily because a larger proportion of students who were enrolled in private schools paid more for tuition and fees. However, school costs were not only much lower than those of other students but were distributed in a different way. The total living expenditures

for 4 years were \$3,598, or about \$300 more than a married student with children paid for food alone. The largest item of living expense was recreation, which cost \$900 (25 percent) while his out-of-pocket expense for food and lodging combined was \$960 (27 percent). He devoted a larger share of his budget to personal maintenance than other students did.

Source of Student Income

The dental student drew most of the money required to finance his education from sources within his own family. He supplemented these amounts with funds from other sources—scholarships, loans, or benefits available under the GI bill. This was true of both the married and the single student, though they differed in the extent to which they utilized each source (table 2).

The married student relied more heavily on his wife's earnings than on any other type of assistance. If there were no children in the family, her earnings covered more than half of all his expenses. Most of the remainder came from his own earnings and personal savings and from sums supplied by his parents. The presence of children in the household made drastic changes in this financial pattern. His

Table 2. Distribution of average 4-year expenditures by source of funds, 1953-54

| category | Number of students | Total | Source of funds | | | | | | | | |
|---|--|-----------|-----------------|----------|--------------|-----------------|------------------|--------------|--------------|-------------|-------|
| | | | Parents | Savings | Own earnings | Wife's earnings | Veteran benefits | Scholarships | School loans | Other loans | Other |
| Children with children Children without children From home From school From other From other From other From other From other From other | 2, 021 2, 144 3, 825 1, 531 2, 021 2, 144 3, 825 1, 531 2, 021 2, 144 3, 825 1, 531 | Amount | | | | | | | | | |
| | | \$14, 631 | \$3, 027 | \$2, 551 | \$2, 252 | \$3, 645 | \$1, 796 | \$120 | \$110 | \$705 | \$125 |
| | | 14, 281 | 2, 118 | 1, 843 | 1, 274 | 7, 546 | 825 | 108 | 51 | 269 | 241 |
| | | 10, 341 | 6, 094 | 1, 941 | 1, 073 | ----- | 295 | 145 | 64 | 465 | 261 |
| | | 8, 295 | 4, 304 | 1, 933 | 1, 183 | ----- | 201 | 178 | 25 | 223 | 218 |
| | | Percent | | | | | | | | | |
| | | 100. 0 | 20. 7 | 17. 4 | 15. 4 | 24. 9 | 12. 3 | 0. 8 | 0. 8 | 4. 8 | 2. 9 |
| | | 100. 0 | 14. 8 | 12. 9 | 8. 9 | 52. 8 | 5. 8 | . 8 | . 4 | 1. 9 | 1. 7 |
| | | 100. 0 | 58. 9 | 18. 8 | 10. 4 | ----- | 2. 8 | 1. 4 | . 6 | 4. 5 | 2. 6 |
| | | 100. 0 | 51. 9 | 23. 3 | 14. 3 | ----- | 2. 4 | 2. 1 | . 3 | 2. 7 | 3. 0 |

student who lived at home while attending dental college, presumably because somewhat smaller shares of living costs were reported as expenditures.

Regional variations in living costs did not affect all categories of students in the same way. Costs were highest in the West for the married student (\$10,626) and the single student living away from home (\$6,203). The South was most expensive for the single student living at home (\$4,146).

The greatest variations in the levels of living expense are the result of marital status and housing arrangements, and for this reason the cost involved in seeking a dental education is much greater for the married student than for the single student, and the single student away from home has more expense than the student who lives with his parents.

The Married Student

At the time of the study, about 44 percent of the students were married, and nearly half of these had children. The proportion of married students increased progressively from 31 percent of the freshman class to 63 percent of the seniors. Since marital status is associated with age, it is not surprising that relatively more veterans were married than nonveterans. Two-thirds of the veterans in the freshman class were married; by the senior year, the proportion was 3 out of 4.

Among nonveterans, one-fifth of the freshmen were married; the proportion increased to 50 percent by the senior year. The fact that so many of the nonveterans are married men is an important factor in the future planning of housing facilities. Although the proportion will decline with the withdrawal of the veterans from campus, the number of married students is likely to remain well above the pre-war level and perhaps at the current figure for nonveterans. Schools should therefore plan for a relatively large proportion of married students as a permanent part of dental school enrollments.

For the married student, the total cost of 4 years in school averaged \$14,452. His school expenses amounted to \$1,410, a figure very close, to the all-student average. However, living

expenses, which totaled \$10,042, were more than \$2,500 above the figure for all students, and over \$4,000 higher than the amount spent by single students living away from home. Most of the added expense could be traced to the higher cost of food and lodging.

Seven out of eight married students had established their own home either in houses or apartments, and the cost was two and one-half times as great as that for single students away from home. Food bills were from 25 to 50 percent higher. Purchases associated with furnishing and maintaining a home resulted in miscellaneous expenditures 4 times as great as those of the single student.

The presence of children in the home did not bring any substantial increase in overall costs for the married student, although certain differences in the allocation of expenditures developed. Where there were no children, the average cost of housing was \$2,479, or about 25 percent of all living expenses, and food purchases required \$2,637 (27 percent). For the student with children, food bills rose to \$3,259 (32 percent) and less was spent for housing (\$2,354 or 23 percent). The presence of children meant larger outlays for health and medical care, which rose to \$592, while the childless student spent only \$313. The added cost for health services for the student with children was offset by his lower expenditures for personal maintenance and recreation. Because of this tendency to meet higher expenses in one area with lower expenses in another, total living costs for the married student with children averaged only \$444 more over 4 years than those of the student who had no children.

The Single Student

Fifty-six percent of all dental students were single. One out of four of them lived at home while attending school, and by doing so substantially reduced the cost of their education. The remaining 75 percent had accommodations in dormitories and fraternity houses on the campus or in rooms and apartments nearby.

The student living away from home had total expenditures averaging \$10,341, and since this amount reflects essentially the total cost of all items of school and living expense, it pro-

Modern Methods in Preventive Medicine

Striking evidence of the application of modern methods and viewpoints in preventive medicine appears in the three papers presented on the following pages. They were given at the third annual meeting of the American College of Preventive Medicine on November 14 and 15, 1956, held in conjunction with the 84th annual meeting of the American Public Health Association, Atlantic City, N. J.

As the scientific, sociologic, and economic horizons have widened in this country, so have public health needs and potentials. A group which can testify to this from direct experience includes physicians actively engaged in or concerned with public health at the State-community level. From such a group evolved the impetus that resulted in the founding of the American College of Preventive Medicine, a professional organization stressing scientific development and application to public health.

The American College of Preventive Medicine is a relatively new society, comprised of physicians trained and active in the fields of preventive medicine and public health. It was officially organized in April 1954. But its real beginnings lie in the early days of the Association of State and Territorial Directors of Local Health Services, which had as one of its primary objectives the organization of the American Board of Preventive Medicine. Through the conjoined efforts of this and other professional associations, this objective was accomplished in 1949.

In a short time the idea began to develop among the diplomates of the board that an organization similar to the colleges or academies composed of specialists of other disciplines should be set up. Dr. George A. Dame, then president of the Florida Academy of Preventive Medicine as well as of the Association of State

and Territorial Directors of Local Health Services, took the initiative in bringing together a large group of interested diplomates to consider the question. This meeting in April 1954 resulted in the founding of the American College of Preventive Medicine. Among its objectives are:

- To maintain and advance the highest possible ideals and service standards in education, practice, and research in preventive medicine and public health.
- To encourage and aid medical colleges in establishing a systematic method of teaching preventive medicine and public health . . .
- To encourage, promote, and support the several schools of public health in the universities.
- To stimulate development of residency training centers in preventive medicine and public health.
- To support development and strengthening of sound local health departments to serve all populations and areas in our country.
- To enhance and maintain the interest of practicing physicians in preventive medicine and public health, and to further their training in these specialties.
- To promote the positive health of the individual and of the community.

The college works closely with the American Board of Preventive Medicine in developing and approving residency training programs and is active in improving intraining opportunities for public health personnel and in many other areas of its specialty. It has moved ahead rapidly along the lines of its objectives, and membership early in 1957 totaled 783 fellows. Each member is required to be a diplomate of the American Board of Preventive Medicine.

wife's earnings then provided only a quarter of his expenses. To make up the deficit, the student dipped deeper into his savings, and the amount he earned while attending school almost doubled. His parents increased their contribution by nearly a third, and he added to this by almost tripling the amounts he borrowed. Aid received from scholarships also increased.

Both categories of single students received most of the money which paid for their education from their parents and supplied the remainder from personal savings and earnings. Parents supplied about 59 percent of funds for the student away from home and 52 percent for the student living at home. However, since the student at home was instructed to list only his own out-of-pocket expenses, the aid this student actually received from his parents would generally be much greater than these percentages indicate.

Veterans' benefits comprised only 6 percent of total funds for all students, but they made a substantial contribution to the funds of students who received them. The average amount received from this source by different categories of students varied; for the married veteran with children the benefits covered a sixth of his total costs, and for the single veteran who lived with his parents, they covered about a seventh.

Scholarships and loans were other sources of funds which were of more importance to individual students than they appear to be when averaged for an entire category of students, and the amounts obtained from them were greater for married students with children than for any other group.

Indebtedness

In spite of the substantial financial assistance received from various sources, 57 percent of all dental students were in debt by the time they were graduated. Fourteen percent owed \$6,000 or more, 23 percent owed between \$2,000 and \$5,999, and another 20 percent, amounts less than \$2,000. The size of the indebtedness rose progressively over the 4 years in school, with

the average debt per student increasing from \$2,193 to \$4,230 between the freshman and senior years.

Conclusion

The cost of a dental education is so high that no category of students, married or single, was able to provide as much as half of total expenses from personal savings and earnings. Most students depended upon wives or parents for the major portion of their funds, and many of them went deeply in debt. For some students, particularly for those from low income groups who could not expect substantial aid from their families, the GI bill covered a large share of the costs of education. Other equally effective programs of financial aid would obviously make available to the dental profession a reservoir of capable students at a time when there is a growing need for qualified practitioners.

It should also be emphasized that despite the changing composition of the current dental student body and the gradual withdrawal of the veteran from the campus, married students will continue to make up an important segment of future enrollments. The especial needs of these students in terms of housing and other campus accommodations should be a major factor in planning future school facilities. Provisions for adequate, low-cost housing for married students would do much to solve their particular financial problems.

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selects only those patients for whom he feels he can ethically accept the alternatives. Once he has decided to include a patient, treatment is assigned in the central office by a system of random numbers, and the patient is treated with the assigned medication for a specified period. This is a critical point in the studies: a system in which treatment is assigned by persons who have no knowledge of the patient. It eliminates any influence, conscious or unconscious, which physicians treating the patient might exert on the assignment of treatment regimens. Not only is this method simpler for the physician responsible for the care of the patient but it is also the only sure way of obtaining groups of patients that are alike at the moment the different chemotherapeutic regimens are started. Thus, any subsequent differences between the groups can be attributed to the effects of chemotherapy.

Only in two exceptional circumstances is treatment altered: if a patient develops an intolerance to one or more of the assigned drugs or if his disease becomes critically worse, threatening his life.

The number of patients in a study ranges from 541 in the first cooperative effort, with 12 participating hospitals, to 1,990 in one of the more recent trials, with 29 hospitals. The size of these studies insures that the results are unlikely to be due to chance variation. In addition, it permits examination of the influence of various factors, such as age, race, and sex of the patient and stage and extent of disease, on the response to treatment.

In this era of bigness the impression is sometimes created that numbers alone are enough. But a definitive study depends only partly on size. These studies have also been carefully designed with these points in mind: What are the critical questions? What observations will provide the most information? How can these observations be made most objective and accurate?

Random allocation of treatment provides treatment groups completely comparable at the beginning of a study. By several other devices we try to obtain objectivity and freedom from bias in measuring the effects of treatment.

In testing for bacterial resistance, for example, sputum cultures are first examined in

each hospital laboratory by technicians who are not allowed to know the patient's treatment. All positive cultures from all hospitals are sent to one central laboratory not associated with any of the hospitals. There each culture is tested for drug sensitivity without the bacteriologist's knowing the patient's regimen. In every study, many cultures are tested for sensitivity to drugs that the patient is not even receiving. The results of these cultures provide valuable information on the validity of the other results.

In the interpretation of X-rays, as another example, duplicate X-rays of each patient are taken monthly. One is kept at the hospital and one is sent to the central office. Periodically, the participating clinicians meet in Washington to review all the films. The serial films for each patient are read independently by three readers who do not know the patient or his treatment regimen. Each reader interprets the films for an equal number of patients on each regimen from every hospital except his own.

We shall now review briefly the nine cooperative studies carried out since 1947, tracing the evolution of tuberculosis chemotherapy and highlighting the results of the studies. In each subsequent study, new regimens are tested against the regimen which has previously given the best results. A summary of the studies is presented in figure 1.

Streptomycin and PAS

In the first study streptomycin was tested against no chemotherapy. A randomly selected half of the 541 patients received the classic treatment of bed rest, diet, and surgery, while their counterparts in each hospital received, in addition, streptomycin for the first 3 months of a 12-month observation period. Physicians in the 12 hospitals participating in this investigation deserve credit for their courage in carrying through a study in which streptomycin was withheld from half their patients.

By every criterion, patients who received streptomycin for 3 months were in better condition after 12 months than were the controls. Seventy percent of the streptomycin patients showed X-ray improvement, as compared with only 45 percent of the controls. Cultures were

Chemotherapy of Tuberculosis, Progress and Promise

THE DECLINE in tuberculosis mortality in the United States, which began in 1910, has been sharply accelerated during the past 10 years. Tuberculosis deaths dropped from 40 per 100,000 in 1945 to about 10 in 1955. Although this drop may be due in part to a slight decrease in new cases and perhaps in some measure to earlier detection of the disease, it must be primarily a result of improved treatment. Without question, the greatest single factor in the improvement of treatment has been the development of antimicrobial agents active against the tubercle bacillus.

Adequate assessment of the new drugs required new methods in clinical research. Aside from the knowledge about what could be expected of various antimicrobial agents, the most significant result of the evaluation of tuberculosis chemotherapy was the evolution of the large-scale, centrally coordinated, cooperative control study. The pattern developed for this type of study has elements necessary for evaluation of any treatment, in tuberculosis or in other diseases. A review of the therapy trials of the Public Health Service will not only summarize the present position of the chemotherapy of tuberculosis but will illustrate the scope and possibilities of such studies.

The Public Health Service first became engaged in evaluating tuberculosis treatment in

1947, when it acted as the central office for a control study of streptomycin. Congress had made special funds available for testing this antibiotic, the first to show marked antituberculous activity in the test tube and in animals. To avoid possible repetition of the disappointment and disillusionment that followed the high hopes raised by previous "wonder" treatments, such as gold, it was necessary to test streptomycin in such a way that the great desire to find an effective drug would not influence the appraisal of its efficacy. Therefore, it was decided that the available funds should be spent largely on control studies carried out in a number of hospitals throughout the country.

To date, the Public Health Service cooperative group has undertaken nine studies on tuberculosis therapy. Tuberculosis clinicians in hospitals in all parts of the country have voluntarily pooled their facilities and case material to carry out carefully designed control studies. This cooperative arrangement provides wide geographic representation, which gives a picture of variations in the disease and its response to treatment in different parts of the country. The Public Health Service has organized the studies, provided detailed protocols, assigned treatment regimens, coordinated the work in the participating hospitals, analyzed the data, and provided financial assistance to the hospitals to meet the special study expenses.

Each clinician relinquishes some autonomy in treating patients he places in a study. But he is aware of the exact limits of the restrictions because he himself has helped to plan the study. Knowing that any patient placed in the study may by chance receive any one of the regimens to be investigated, the clinician

This paper was presented before the American College of Preventive Medicine by Dr. Rufus Payne, Medical College of Georgia, Augusta, one of the clinical investigators in the Public Health Service tuberculosis therapy trials. It was prepared by Shirley H. Ferebee and Dr. Frank W. Mount, Tuberculosis Program, Division of Special Health Services, Public Health Service.

tion that isoniazid must be compared in strict control studies with the best therapy then available, that is, streptomycin plus PAS. Consequently, in that same month, representatives of 22 tuberculosis hospitals met in Washington and adopted a common protocol to evaluate the therapeutic efficacy of isoniazid. Within 5 months 1,535 patients were under observation.

In the course of these investigations, bacteriological change had emerged as the most sensitive index of the effectiveness of antimicrobial agents. In the charts to follow, bacteriological results of various regimens are compared for previously untreated patients who were infectious when they were admitted to the studies.

Isoniazid

Since the second study had shown streptomycin plus PAS to be superior to streptomycin alone, we used streptomycin plus PAS in the third study as the yardstick against which to measure isoniazid alone and isoniazid in combination with streptomycin. For all regimens the decrease in positive cultures was rapid during the early weeks of treatment. By the 40th week, however, cultures were still positive for 39 percent of the patients treated with streptomycin plus PAS and 38 percent with isoniazid alone, but for only 25 percent with isoniazid plus streptomycin (fig. 2).

Having found isoniazid plus streptomycin superior to either streptomycin plus PAS or isoniazid alone, we proceeded to a fourth study, which included 1,799 patients. We used isoniazid plus streptomycin as the basic regimen and compared it with isoniazid plus PAS and with all three drugs together, isoniazid plus streptomycin plus PAS. We also investigated the possibility that better results might be obtained by increasing the daily dose of isoniazid from 3 mg./kg. to 10 mg./kg.

The three regimens with 10 mg./kg. of isoniazid were about equally effective in reversing infectiousness (fig. 3). At the end of 40 weeks of treatment, tubercle bacilli were detected in the cultures of 17 percent of the patients treated with isoniazid plus streptomycin, in 8 percent treated with isoniazid plus PAS, and in 6 percent treated with all three drugs. Although

there was no therapeutic advantage when the dose of isoniazid was raised from 3 to 10 mg./kg., the 10 mg./kg. dose was considerably more toxic, producing peripheral neuritis in about 10 percent of the patients. On the basis of these findings, we reasoned that the regimen of choice at that point was isoniazid at 3 mg./kg. plus PAS, which would leave streptomycin to be used later if necessary.

Switching Regimens

In all these studies bacteriological changes were rapid during the early weeks of treatment, but patients still producing positive sputum after the 20th to 24th week seldom became negative. This observation led to the fifth study, in which major drugs were switched after 24 weeks of treatment and different sequences tried. For the first 24 weeks we gave half the patients isoniazid plus PAS and half streptomycin plus PAS. Then we switched half the patients receiving isoniazid plus PAS to streptomycin plus PAS and half those receiving streptomycin plus PAS to isoniazid plus PAS.

During the first 24 weeks, when half the 1,990 patients were receiving isoniazid plus PAS and half streptomycin plus PAS, the decrease in positive cultures was greater with isoniazid plus PAS (fig. 4). By the 24th week cultures

Figure 2. Percentage of patients with positive cultures during 40 weeks of treatment with streptomycin plus PAS, isoniazid, or isoniazid plus streptomycin.

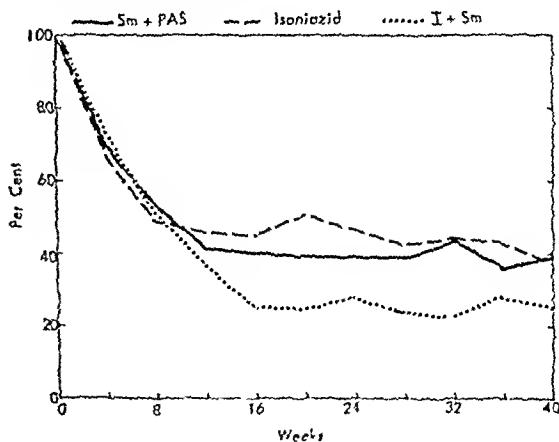
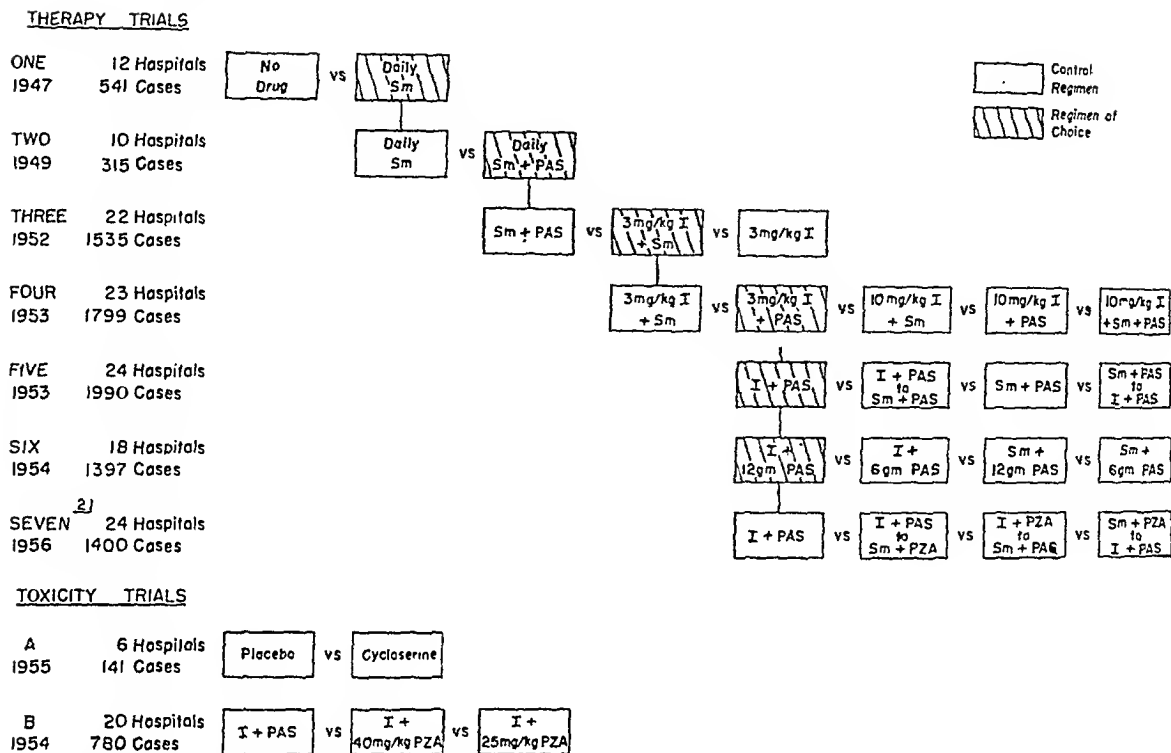


Figure 1. Summary of the Public Health Service tuberculosis therapy trials.¹



¹ Unless otherwise specified, Sm (streptomycin) was given in doses of 1 gm. 3 times a week; I (isoniazid), 3 to 5 mg./kg. daily; PAS (para-aminosalicylic acid), 12 gm. daily; and PZA (pyrazinamide), 40 mg./kg. daily. Cycloserine was tested in four dosages: 0.5 gm. twice a day, 1.0 gm. every second day, 0.5 gm. once a day, and 0.25 gm. twice a day.

² In progress.

negative for 24 percent of the streptomycin patients but for only 16 percent of the controls. The most striking finding in this first study, however, was that streptomycin halved the number of deaths: Only 10 percent of the streptomycin patients, as compared with 20 percent of the controls, died during the year of observation.

Shortly after streptomycin was introduced, PAS (para-aminosalicylic acid) became available in this country. With the usefulness of streptomycin clearly evident, the cooperating group decided its second study should compare streptomycin alone with streptomycin plus PAS. Since PAS showed much less tuberculostatic activity than streptomycin in the test tube and experimental animals, it was not thought necessary to include a group receiving only this drug. Each of 315 patients was randomly assigned to receive either streptomycin or streptomycin plus PAS for 3 months,

with observation to continue for another 3 months. The primary purpose was to see whether PAS might prolong the usefulness of streptomycin by delaying the emergence of streptomycin-resistant organisms. It was found that not only did PAS prolong the streptomycin sensitivity of the tubercle bacilli, but it increased the frequency of sputum conversion and resulted in greater X-ray improvement.

By 1952 the price of a gram of streptomycin had fallen from \$20 to about 20 cents, and the drug was available in plentiful supply, as was PAS. The two drugs together had become the standard treatment for hospitalized tuberculosis patients throughout the United States. They were indispensable adjuncts to bed rest and surgery in the long-term care necessary for tuberculosis patients. Then in March 1952 isoniazid made its dramatic entrance. In the midst of tremendous enthusiasm for the new drug, the Public Health Service took the posi-

of PAS with isoniazid, we also used this opportunity to test a lower dose of PAS with streptomycin. We randomly divided the 1,397 patients into 4 groups to receive daily isoniazid with 12 grams of PAS, isoniazid with 6 grams of PAS, streptomycin with 12 grams of PAS, and streptomycin with 6 grams of PAS.

This study demonstrated that PAS toxicity was reduced by decreasing the daily dose. During the 40 weeks of treatment about 11 percent of the patients could not tolerate the 12 gram dose, but only 4 percent could not tolerate 6 grams. Most of the patients who could not tolerate the larger dose were able to continue the drug when the dosage was cut in half.

In combination with either isoniazid or streptomycin the large dose of PAS was slightly more effective than the small dose (fig. 6). Again, the combination of isoniazid plus PAS was superior to streptomycin plus PAS. In fact, even the small dose of PAS with isoniazid was more effective than the large dose with streptomycin.

We concluded that all patients should be placed first on a regimen of isoniazid plus 12 grams of PAS. However, for those unable to tolerate that dose of PAS, the daily dose

Figure 5. Percentage of patients with positive cultures from the 24th through the 40th week among patients treated continuously with streptomycin plus PAS or switched from streptomycin plus PAS to isoniazid plus PAS after 24 weeks and among patients treated continuously with isoniazid plus PAS or switched to streptomycin plus PAS after 24 weeks.

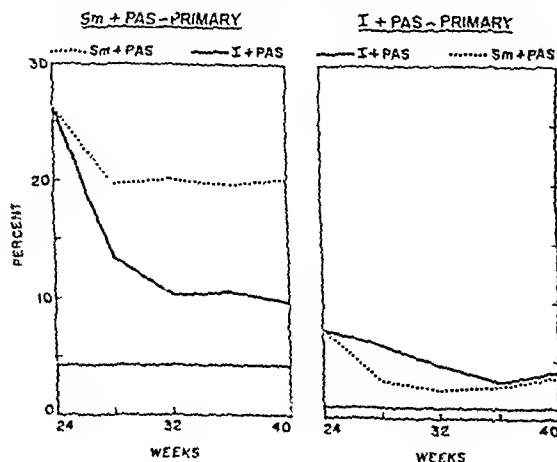
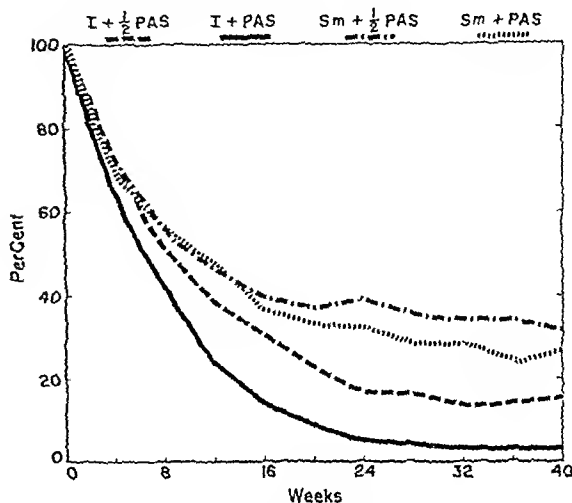


Figure 6. Percentage of patients with positive cultures during 40 weeks of treatment with isoniazid plus 6 gm. PAS, isoniazid plus 12 gm. PAS, streptomycin plus 6 gm. PAS, or streptomycin plus 12 gm. PAS.



could be reduced to 6 grams with only a small loss in therapeutic effectiveness.

Cycloserine and Pyrazinamide

Up to this point, we had been investigating ways of using the three available drugs, isoniazid, streptomycin, and PAS. In the past 2 years we have considered, in addition, two other antimicrobial agents, cycloserine and pyrazinamide. Both drugs had been reported to produce severe toxic reactions. Therefore, before testing their therapeutic efficacy in previously untreated patients, we undertook studies among "hopeless cases" to determine the frequency and severity of the toxic reactions.

In one toxicity study we compared several different doses of cycloserine with a placebo. No significant toxic reactions occurred among the 26 patients receiving placebos, but toxic reactions to cycloserine occurred at all dose levels tested except the lowest, which we found to be below the range of therapeutic effectiveness (see table). Convulsions, the most serious of the toxic effects, were not confined to a single dosage, and we found no evidence that they were limited to patients with certain characteristics. Therefore, in contrast with the safety and effectiveness of isoniazid

had become negative for all but 26 percent of the patients on streptomycin plus PAS and for all but 8 percent of the patients on isoniazid plus PAS. Patients whose cultures had not become negative may be regarded as treatment failures, and their course during the subsequent 24 weeks is reported here.

The treatment failures included patients who died of tuberculosis or whose chemotherapy was changed because of critical worsening, as well as those who continued to produce tubercle bacilli after 24 weeks on the primary regimen. Of course, for those who died there was no opportunity for the secondary regimen to change the course of their disease, and for those whose treatment was changed earlier the status at the 24th week is not a measure of the effect of 24 weeks of treatment on the assigned regimen.

The left chart in figure 5 deals with the 26 percent of the streptomycin-plus-PAS patients who had failed to become sputum negative, including 4 percent who had died or been removed from the regimen. When treatment with streptomycin plus PAS was continued, the failure group decreased to 20 percent by the 40th week. However, when isoniazid plus PAS was substituted for streptomycin plus PAS, the proportion of bacteriological failures dropped to 10 percent by the 40th week.

Figure 3. Percentage of patients with positive cultures during 40 weeks of treatment with isoniazid plus streptomycin, isoniazid plus PAS, or isoniazid plus streptomycin plus PAS.

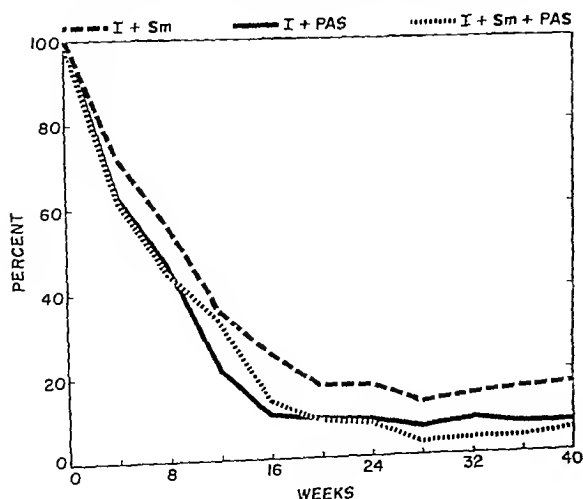
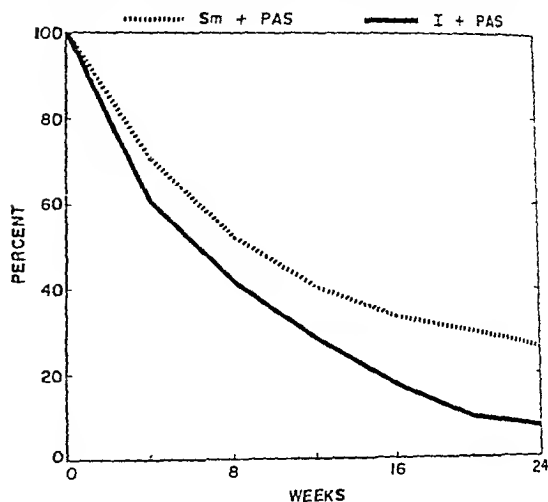


Figure 4. Percentage of patients with positive cultures during 24 weeks of treatment with streptomycin plus PAS or isoniazid plus PAS.



The right chart in figure 5 deals with the 8 percent of the isoniazid-plus-PAS patients whose cultures had not become negative by the 24th week. This group includes 1 percent who had died or had been changed to another treatment regimen. When treatment with isoniazid plus PAS was continued, the percentage of failures dropped to 4 by the 40th week. When treatment was switched to streptomycin plus PAS, the results were no better.

This study showed isoniazid plus PAS to be such an effective regimen that there was little advantage in switching to streptomycin plus PAS after 24 weeks. On the other hand, among patients initially treated with streptomycin plus PAS, a switch to isoniazid plus PAS after 24 weeks was preferable to an additional 16 weeks of streptomycin plus PAS.

Decreased PAS Dosage

Again isoniazid plus PAS appeared to be the regimen of choice both for initial and long-term use. However, it had always had one disadvantage. A number of patients were unable to tolerate the usual large dose of PAS, 12 grams a day. Encouraged by the results of a small pilot study, we decided to see whether decreasing the dose of PAS would reduce toxicity without loss of therapeutic effect. Although we were primarily interested in the use

States, San Juan, Mexico City, and Toronto. Each child takes pills for 1 year, and neither the patient, nor his family, nor the physician knows whether the pills contain isoniazid or placebo. By comparing the number, kind, and severity of complications that develop among children taking isoniazid with the complications that develop among children taking placebos, we expect to determine isoniazid's effectiveness.

In the meantime we are accumulating information to answer an even more basic question: How often today do meningitis and other complications of primary tuberculosis occur? In

other words, we are collecting precise information on how much there is to prevent, by isoniazid or any other preventive procedure.

The next step in the Public Health Service's investigation is to determine whether isoniazid will prevent infection and the appearance of clinical disease among the highly exposed household contacts of active cases of tuberculosis. A nationwide study is being started in which contact households are randomly assigned to isoniazid or placebo groups and are kept under close observation by their local health departments. Each contact is tuberculin tested and X-rayed at the beginning and at

Clinical Investigators in the Tuberculosis Therapy Trials

The following 53 physicians in 39 hospitals scattered throughout the United States participated in the Public Health Service tuberculosis therapy and toxicity trials conducted from 1947 through 1956. The figures and letters in parentheses are trial designations, as given in figure 1.

Baltimore City Hospital, Baltimore, Md.: Edmund G. Bencham (7).

Batley State Hospital, Rome, Ga.: Rufus Payne (2,3,4) and Raymond Corpe (4,5,6,7,B).

Benjamin Franklin Hospital, Columbus, Ohio: Harold Humphrey (5, 6,7).

Cedarcrest Hospital, Newington, Conn.: R. C. Edson (5,6,7,B).

Channing Home for Tuberculosis, Boston, Mass.: Theodore L. Badger (2).

Firland Sanatorium, Seattle, Wash.: Roberts Davies (3,4,B), Daniel Zahn (6,A), and Thomas Sheehy (7).

Florida State sanatoriums in Lantana, Orlando, and Tampa: Roberts Davies (6,7), W. L. Potts (3,4, 5,B), George H. Hames (6,7), Benjamin L. Brock (3,4,5,6,7,B), Henry C. Sweany (3,4,5,B), A. M. Dietrich (4), and Frank Cline (7).

Freedmen's Hospital, Washington, D. C.: Howard M. Payne (1,2,3,4,5, 6).

Glen Lake Sanatorium, Oak Terrace, Minn.: Sumner S. Cohen (3,4, 5,6,7,A,B).

Herman Kiefer Hospital, Detroit, Mich.: Paul T. Chapman (3,4,5,6,7, A,B).

Maybury Sanatorium, Northville, Mich.: W. J. Steininger (3,4,5,6,7, A,B).

Middlesex County Sanatorium, Waltham, Mass.: Francis P. Dawson (2,3).

Missouri State Sanatorium, Mount Vernon, Mo.: Charles A. Brasher (4, 5,6,7,B).

Municipal Tuberculosis Sanatorium, Chicago, Ill.: LeRoy H. Berard (5,7).

New York State hospitals: H. McLeod Riggins (1,2); Hermann M. Biggs Memorial Hospital, Ithaca: N. Stanley Lincoln (1,2); Homer Folks Tuberculosis Hospital, Oneonta: Ralph Horton (1,2); Mount Morris Tuberculosis Hospital, Mount Morris: Arthur M. Stokes (1,2); Ray Brook Sanatorium, Ray Brook: Harry A. Bray (1) and Frederick Beek (2).

North Carolina State sanatoriums in Black Mountain, McCain, and Wilson: Charles D. Thomas (1,3,4,5,6, 7,B), H. Stuart Willis (1,2,3,4,5,B), W. H. Gentry (3,4,5,B), and Herman F. Eason (1,3,4,B).

Olive View Sanatorium, Olive View, Calif.: Emil Bogen (1).

Ohio Tuberculosis Hospital, Columbus, Ohio: R. H. Browning (7).

Pennsylvania State sanatoriums in Cresson, Hamburg, Philadelphia, and South Mountain: J. L. Wilson (3,4,5), H. W. Weest (3,4), Frederick R. Lang (B), G. M. Eckley (3,4,5,7,B), and H. C. Dooling (3, 4,5).

Pittsburgh Tuberculosis Hospital, Pittsburgh, Pa.: George E. Martin (3,4,5,6,7,B).

Robert Koch Hospital, Koch, Mo.: Alfred Goldman (1,2,3,4,5,7,B) and Mario Pianetto (3,4,5,7,B).

San Antonio State Tuberculosis Hospital, San Antonio, Tex.: E. H. Gist (5,B) and E. H. Roberts (6,7).

Seward Sanatorium, Seward, Alaska: Lawrence M. Lowell (1).

Stanford University Hospital, San Francisco, Calif.: William M. Kirby (1).

Sunny Acres Tuberculosis Hospital, Cleveland, Ohio: Harold G. Curtis (3,4,5,6,7,B).

Tennessee State Tuberculosis sanatoriums in Memphis and Oakville: E. P. Bowerman (3,4,5,6,7,A,B) and F. H. Alley (3,4,5,6,7,A,B).

Uncas-on-Thames Sanatorium, Norwich, Conn.: George C. Wilson (3,4,5,7,B).

U. S. Public Health Service Hospital, Brooklyn, N. Y.: Raymond Hofstra (3), J. E. Wilson (4,5), and Erwin Blatter (6,7).

Toxic reactions of patients unable to tolerate assigned cycloserine regimens

| Cycloserine regimen | Number patients treated | Number with toxic reactions ¹ | Number with convulsions |
|-------------------------------|-------------------------|--|-------------------------|
| Total..... | 115 | 18 | 8 |
| 0.5 gm. twice daily..... | 25 | 11 | 4 |
| 1.0 gm. every second day..... | 39 | 5 | 3 |
| 0.5 gm. once daily..... | 38 | 2 | 1 |
| 0.25 gm. twice daily..... | 13 | 0 | 0 |

¹ Includes convulsions.

plus PAS, we concluded that cycloserine was too toxic for us to undertake a large-scale therapeutic trial in patients with a favorable prognosis.

Pyrazinamide had been reported to have a dramatic therapeutic effect when used with isoniazid but to cause acute liver damage in some patients. In a carefully controlled study among 780 treatment failures, we used isoniazid plus PAS as a control and tested 2 doses of pyrazinamide in combination with isoniazid. Liver function tests were carried out in the hospital laboratories by technicians who did not know what drugs the patients were receiving, and the patients were examined for signs and symptoms of hepatitis by physicians who had no knowledge of their treatment.

During the first 12 weeks of treatment, evidence of hepatic toxicity was reported for 0.8 percent of the patients receiving isoniazid plus PAS and for 0.8 and 1.2 percent of the patients receiving, respectively, 40 mg./kg. and 24 mg./kg. of pyrazinamide with isoniazid. During the second 12-week period liver damage appeared among 5.4 percent of those receiving the larger dose of pyrazinamide and among 1.2 percent of those receiving the smaller dose. These findings, plus the fact that the treatment failures had shown considerable therapeutic benefit from the combination of isoniazid and pyrazinamide, made us decide to undertake a large-scale therapeutic trial of pyrazinamide in combination with isoniazid and in combination with streptomycin. However, we are using pyrazinamide for only 16 weeks and are then switching regimens. This study was be-

gun only recently, and it will be some months before results will be available.

Prophylactic Possibilities

For those of us concerned with preventive medicine, interest in the treatment of persons with active pulmonary tuberculosis is not confined to the direct benefits to the patients. We are sensitive to an indirect benefit from improved treatment: the decrease in spread of disease. More infectious persons are willing to accept treatment, and infectiousness is reversed in most of those treated.

Now, isoniazid introduces the possibility of a new method of tuberculosis control: prophylaxis. It is a cheap, orally administered drug that has been demonstrated during the past 4 years to be extremely effective in the treatment of patients with tuberculosis and to be practically nontoxic in therapeutic doses. A drug that can reverse the course of far-advanced cavitary disease might, if given at the right time, prevent the appearance of clinical disease.

Prophylaxis in tuberculosis has become a highly controversial subject. Some enthusiasts advocate immediate widespread use of the drug in highly exposed population groups. Others are equally firm in their conviction that such use of isoniazid would have grave consequences by interfering with the development of natural immunity. But there is also a middle ground, one occupied by many physicians and public health workers. They feel, as does the Public Health Service, that only a series of large, long-term, controlled investigations can provide actual data to replace the present spate of conjecture on the effects of using isoniazid to prevent clinical tuberculosis in human beings.

The Public Health Service and a number of cooperating clinicians and public health workers have begun a series of studies on the prophylactic possibilities of isoniazid. In the first study in human beings, the prophylactic goal is the prevention of meningitis and other complications among children with asymptomatic primary tuberculosis whose present condition does not require treatment. More than 2,000 children are now under observation in 31 pediatric clinics in the continental United

Public Health and the Social Sciences

By HENRY VAN ZILE HYDE, M.D.

PUBLIC health physicians and their professional colleagues have an implied responsibility for assisting peoples of the world to improve the shape of their affairs. Let us consider what the world role of public health may be and how the social sciences may be of use in playing it.

The social sciences occupy a strange place in the world of learning. They are not quite accepted in the parlor, but it is being increasingly recognized that they are cooking something promising in the kitchen. James B. Conant, struggling in his Terry lectures with the question of the place of the social sciences on today's scene, concludes that perhaps the social scientist should be considered a social philosopher and points out what a sterling word "philosopher" really is. Alfred North Whitehead, considering the place of science in the modern world, finds a tendency for the natural sciences to fall into grooves and to miss the necessary comprehension of man's life among men. Despite the great accomplishments of the natural sciences, we have, he says, no expansion of wisdom, when we are in greater need of it than ever before.

Do the social sciences, as a philosophy in the original Greek sense, perhaps fit into the niche that is vacant? Do they, in dealing with the problems of man's relation to man, somehow provide, or at least promise, a bridge between the coldness of the test tube and the warmth of human feelings?

The social sciences consist only of attempts to apply known techniques of observation, experimentation, and logic to man's total be-

havior as a rational and emotional animal, and to the groups through which he acts and relates himself to others. They are attempts to look at human feelings through the test tube.

Again, as in the case of the natural sciences, grooves form: psychology, social psychology, sociology, economics, anthropology, and so on. Knowledge today is so vast that it must be organized. It is necessary to make certain that such organization does not create intellectual iron curtains. Rather, it must create bridges between areas of thought and knowledge.

Science proceeds by the formulation and testing of concepts, amending, enlarging, and replacing them as fact and experience, seen through the glass of wisdom, may dictate. The social sciences may, because of the material with which they deal, be expected to develop broadening concepts dealing with man's relations with man, concepts which when institutionalized may lead to a richer life. The United Nations did not arise full-formed, Venus-like from the sea, but is the institutionalization of concepts that have developed and progressed through the centuries. Thucydides, in fact, set the philosophical and political stage for the United Nations when he said that discussion does not block action but is the only precursor to action that wisdom can allow.

On the basis of what we have seen of the social sciences to date, should we be frustrated and throw up our hands in despair? Raymond Fosdick, in his thoughtful treatment of the social sciences in the Story of the Rockefeller Foundation, says that "unless we find successful solutions to some of the intricately complex and fast-growing problems of human relationship, we run the risk of having a world in which public health and medicine are of little signifi-

Dr. Hyde is chief of the Division of International Health, Public Health Service.

the end of a year of prophylaxis. Included in the study population are both uninfected (tuberculin negative) members of the household and infected (tuberculin positive) members who show no clinical evidence of disease. The study should provide information on the effectiveness of isoniazid in preventing new infections and in preventing development of clinical disease in those already infected. Because this study includes a group that gets only placebos, it will also provide information on just how much tuberculosis is arising today among household contacts of the tuberculous.

In still another branch of this investigation, isoniazid's effect among previously infected persons who are not in highly exposed situations will be studied. An impressive body of evidence is accumulating that much of the new clinical tuberculosis is occurring among previously infected persons whose subclinical infection progresses to active disease under either

external stress or decreased general resistance. It seems most important to determine whether the threat of tuberculosis which millions of older persons infected in childhood carry with them can be removed by prophylactic use of isoniazid.

This difficult and costly investigation may show that isoniazid has no prophylactic value, or that its value is offset by interference with natural immunity, or that it is effective only while it is being taken. It may show that it only delays but does not prevent. On the other hand, if it is effective in any one of the areas under investigation, in preventing infection, in preventing new infection from progressing to clinical disease, or in eradicating old subclinical infections which may flare up in endogenous disease, we will have gained an important public health weapon in the fight against tuberculosis.

Cerebral Vascular Disease Program

The first nationwide cooperative research program on cerebral vascular disease was launched in April 1957.

Ten medical research centers in 9 States have joined in the program, and it is expected that 35 to 40 institutions will eventually participate. The program, which is under the auspices of the National Institute of Neurological Diseases and Blindness of the Public Health Service, was made possible by grants from the National Institutes of Health to the various participating organizations. The program is supplemented by 29 current research projects on various aspects of cerebral vascular disease.

Cooperative investigation will make possible the study of thousands of patients who either have suffered a stroke or who show clinical signs indicating that a stroke might be approaching. The program is specifically concerned with patients suffering from cerebral vascular disease involving hemorrhage, blood clots, blood tumors, (aneurysms), and malformations of the arteries or veins of the brain.

Research results may reveal more about the nature and causes of strokes and facilitate more effective treatment methods.

Data collected will be collated and evaluated at the University of Iowa, Iowa City, one of the cooperating institutions.

Understanding the Individual

What are these forces that we need to understand? One is the behavior of individuals in settings of various complexities. What are the forces that influence the individual? This may not seem relevant when we are considering the world stage, but it is. The world is run by human beings, each an individual shaped by a multitude of antecedent forces. Often the individual is lost in the vastness of the action that he has taken or influenced, but all world actions are the result of the component forces at work on the world stage, and those forces are transmitted through individuals and modified by transmission. Personal pique and animosity, emotional reactions, individual blind spots play their role internationally as they do at home, affecting the course of history.

At Versailles, after World War I, Masaryk, the father of Czechoslovakia, was one of the great leaders. He was known for his wisdom, his ideals, and thus was able to give leadership and direction to the shaping of the new Europe. Only on one point did he become irrational and obstructive. He insisted upon the inclusion within Czechoslovakia of a small nipple of land that projected beyond the proposed borders of Czechoslovakia into what was logically a part of Poland. Why did he do this? Because his birthplace, his hometown, lay within that area. Thus it is men who make the events of history and men that need to be understood. Public health deals with men and has a chance, perhaps, to understand men and thus to enable them to understand themselves.

The problems of the community tend to stand out in progressively bolder relief the farther we move from our own culture, setting aside, as we do, the blinders of our own experience and our own emotional involvements. For this reason and because of my particular international orientation, I take an example from abroad, in the expectation that we may see analogies in our own communities, to indicate the complex skein of forces that interweave within a community.

Sindbis is a crowded, squalid Egyptian village. The streets are narrow, muddy, and laden with refuse. The Rockefeller Foundation addressed itself to the problem of improving health in this village and worked there for 3

years. It was easily demonstrated that infant mortality and therefore general mortality could be sharply reduced by the application of insecticides to control the flies. This, though, was a temporary measure, the flies becoming rapidly resistant to the insecticides. The demonstration pointed to the absolute necessity of improving sanitation if anything significant were to be accomplished.

An Egyptian home is a mud-walled compound off of which open 2 or 3 small, unventilated rooms; a rickety stairway goes up to similar small rooms above. In crowded villages such as Sindbis, the compound is often roofed-over by the upper rooms. In the compound, which measures perhaps 10 by 10 feet, there dwell, in addition to the family, a gamoose (a water buffalo), a sheep or two, and several chickens. These are occupying what to you and me is the living room. In the corner is a pile of dung cakes. The floor is carpeted by the accumulated dung of decades. Meals are cooked over an open fire in a corner of the compound. It would appear that health education in its simplest forms might readily solve such obvious problems. But let's look at some of the factors concerned.

Sindbis is built upon some of the most precious land in the world. In Egypt, on 13,000 square miles of arable land, 23,000,000 people, 1,800 people per arable square mile, are attempting to eke out an existence. It is not possible for Sindbis to expand laterally over such precious land, nor, since the only available building material is mud or sun-dried brick, can it extend vertically. A second story is risky; a third story, impossible. On May 12 and 13, 1945, rain in parts of the Delta, the only rain I ever saw in Egypt, washed away such villages as this.

If we cannot provide better housing within the locally available resources, then we can at least clean out the dung. But this approach also presents problems. The dung is one of the family's most important assets, both for fertilizer and for fuel. It cannot be risked outside but must be kept under guard.

Then let us move the animals out. Did you ever suggest to your own family the possibility of getting rid of your own dog? The eyes of a gamoose, I can testify, are infinitely more

cance." He further cautions against impatience in this difficult task, saying, "The impatient analogy between the spectacular progress of public health and medicine and what could conceivably be accomplished by the social sciences is basically unsound. Human emotions and prejudices, unlike human diseases, do not yield easily to rational solutions. We can look forward to no mechanistic answers which will automatically solve the problems of human adjustment. The assumption has to be made that there is time for intelligence to take hold, and students of society have to presuppose the opportunity for long-maturing work." The Rockefeller Foundation and more lately the Ford Foundation are betting hundreds of millions of dollars on this assumption.

The Relation to Public Health

How does this relate to public health? to members of the profession?

Public health is in a unique position in relation to man and his communities. It is also an activist cult, the self-imposed business of which is to change man's behavior. Because of its opportunity and its activities, public health has an obligation to study, within its own field of vision, the processes that affect man's behavior. We are the high priests of an activist cult. We must accept the responsibilities of priesthood, unless we are to become practitioners of a stultified priestcraft such as served their own purposes under the protecting wings of Amen-Ra in far-off times. We must learn not only how, but whether and when to activate. The social sciences offer the best available avenue for the exploration of the city of fact and relationship in which each of us lives—to obtain a better comprehension of the community of man and how best to modify it in the interests of man.

The trouble of our times, great in scope and profound, is based on man's failure in governing his relationship to himself. The connection with public health may appear at first glance to be loose and remote. Such is not the case: Health today is not on the periphery of history but at or very near its center. In the most populous areas of the world where

the masses are sick, it is one of the major factors affecting man's relationship to himself and to his environment.

One phase of the role of public health in the world today is its modification of man's relationship to himself and to his environment. This modification initiates chain reactions in the social and economic spheres, the end of which is not always, if ever, in sight. Public health has, for instance, launched a vast malaria eradication program, with a view to eliminating the 300 million cases of malaria that once occurred each year. A number of countries, including our own, have already attained the objective of eradication, and the world goal is not an impossible one. Can we foresee the ultimate effects on mankind of such a change? We know it will have effects on man's ability to produce. It will provide increased labor in the fields during planting and harvesting time; it will open up new lands; it will make man more alert and educable. Yes, and it will increase the population where populations are already dense. These changes will in turn have their own effects, and these can be foreseen but dimly.

The world can never again be what it once was. Asia, particularly the areas in the tropics and semitropics and the Middle East, and Latin America are not the same as they were even a short time ago. Their relationships with other more advanced parts of the world in northern Europe and North America are changing, and will change, deeply and fundamentally. Health has a causal relationship to this great historical change. This we cannot avoid, but we can try to understand it and to lead it in a direction that is right by our moral view.

The second phase of the role of public health stems from its peculiarly close association with man and the community. Here is the opportunity for public health to add to the understanding of the human processes that make history. Historic events are due to the working in the macrocosm, the world, of forces that are also at work in the microcosm of our own communities. These forces can be isolated, analyzed, and understood with more precision in the microcosm. On the larger stage they are often lost in the very vastness of the scene.

this be the case, it is possible to understand the points of difference and to prepare to meet and reconcile them.

Profound problems arise, problems we can only suggest in this presentation. For example, is action always to be preferred over apathy? F. S. C. Northrop of Yale, Edmund Taylor in his *Richer by Asia*, and many others have considered how we might attain some profitable fusion of the philosophies of the East with those more characteristic of the West, a reverse point 4 in philosophy perhaps. They suggest that a more intensive search for karma or nirvana might modify the intensity of the search for space and substance, for land and dollars. Such questions have their social and economic implications which are subject to analysis and indeed measurement in economics, which is perhaps the most adult of the social sciences.

If we accept a wholly activist philosophy, then action must be purposeful and the purpose, as well as the results of attainment of the purpose, must be examined. Purposes often seem self-evident. We accept the urgent need for rapid economic development as a truism. But Munoz-Marin, the Governor of Puerto Rico, who has given such magnificent leadership to Operation Bootstrap which has raised Puerto Rico from a slum to a guiding star of progress, has recently offered a tantalizing suggestion. He has proposed an Operation Serenity, through which society "would use its economic power increasingly for the extension of freedom, of knowledge, and of the understanding imagination rather than for a rapid multiplication of wants." When asked how he would accomplish Operation Serenity he said, "I have let a bird into the air."

Avenue of the Social Sciences

Public health must consider how best to address itself to these matters. As already suggested, the social sciences provide the main avenue of the present for applying to these great social problems the techniques and concepts which have carried us so far in the natural sciences, in the hope, of course, that new and special techniques and concepts of a fundamen-

tal character will emerge, in the hope that the social sciences will have their Galileo, their Newton, their Darwin—or will it be a Michaelangelo or a Milton?

The field is being plowed. A number of schools of public health have social scientists on their staffs.

The Health Information Foundation in the 1955 edition of its *Inventory of Social and Economic Research in Health* listed 398 active research projects.

The Social Science Research Council has established the Committee on Preventive Medicine and Social Science Research, which is attempting, slowly but with steady progress, to identify and direct attention to areas requiring fundamental research. Shortly, it plans to begin the publication of documents emerging from its discussions with specialists in a number of fields.

A separate but closely related development of first importance is the creation of the Joint Committee on Public Health and the Behavioral Sciences by the American Public Health, Anthropological, and Psychological Associations and the American Sociological Society. This committee is attempting to lower the barriers existing between the public health professions and the social sciences through the organization of campus seminars, workshops, and newsletter abstracts and other publications.

Summary

Public health physicians have at hand in their own communities on a manageable scale the problems of human and community relations which are today harassing the world. At the same time social scientists in increasing numbers are at hand, on neighboring university campuses, in business enterprises, and in departments of government. Thus the tradition of team work in public health need not be stretched far in an effort to delve thoughtfully and deeply into these problems. The answers found will be a part of the storehouse of knowledge and concept that must lead through these troubled times into a more orderly future.

soulful than even those of a basset hound. There is a deep emotional, as well as economic, attachment to the gamoose. He is part of home and he has been so through the ages. Herodotus in 500 B. C. wrote, "All other men pass their lives separate from animals; Egyptians have animals always living with them."

Thus, in attempting to activate the people of Sindbis, we immediately run into economic considerations of the greatest moment, long-established habits and cultural patterns, and sociological problems.

Universality of the Basic Forces

The same basic forces operate in every community. We would not have a gamoose in our homes, but we do have dogs. Dogs are carriers of rabies, hydatidosis, and flukes whereas, as far as I know, the gamoose is quite an innocent beast. Despite this, we cannot view a dog with the same objectivity with which we view a gamoose.

Herodotus helps us establish the fact that this blindness is not a new thing. He tells us: "Thus it appears certain to me, by a great variety of proofs, that Cambyses was raving mad; he would not else have set himself to make a mock of holy rites and long-established usages. For if one were to offer men to choose out of all the customs in the world such as seemed to them the best, they would examine the whole number, and end by preferring their own; so convinced are they that their own usages far surpass those of all others. Unless, therefore, a man was mad, it is not likely that he would make sport of such matters. That people have this feeling about their laws may be seen by very many proofs: among others, by the following. Darius, after he had got the kingdom, called into his presence certain Greeks who were at hand, and asked what he should pay them to eat the bodies of their fathers when they died. To which they answered that there was no sum that would tempt them to do such a thing. He then sent for certain Indians, of the race called Callatians, men who eat their fathers, and asked them, while the Greeks stood by, and knew by the help of an interpreter all that was said, what he should give them to burn the bodies of their fathers at their decease. The Indians ex-

claimed aloud, and bade him forbear such language."

We can easily overlook in our own environs what might be obvious aberrations when viewed dispassionately by an outsider, unless we apply the critical tools of science to our own behavior and that of our own communities. The answers to the problems of Sindbis are yet to be found, but we have in our own community the laboratory in which the basic principles involved may be better understood.

What are some of these matters as we face them in our own communities?

The cult of success drives us Americans inexorably towards the vice-presidency of the firm. En route we deposit in our arteries great hunks of cholesterol, consumed at feasts paid for by a grateful firm. Or we build up a great head of pressure striving to be foreman of the gang, principal of the school, or State health officer, ignoring what we know, or think we know, of the dangers to our gastric mucosa. This is cultural pressure, our own culture. Can we modify the culture or adjust man to it? Do we preach laziness and apathy? Do we give tranquilizing drugs? Or is there some other way? Daily we drive headlong to our own destruction on the highways. You know this grim story, but who of us has never bragged of the speed he made on some trip? Our culture commends us, if only we keep out of jail. Coronary disease is not all chemistry, and highway safety is not all engineering. They involve man and his behavior in a cultural setting.

The problems of convincing communities to fluoridate water, or parents to bring only certain of their children for a widely touted vaccine, or a woman to palpate her breasts when horror struck that she might feel a fatal lump are examples of problems here at home that have in them, somewhere, answers to fundamental problems of men's relations and motivations.

I have been deeply impressed through the years with the sameness of motivations and responses among people of widely differing cultures. The differences to a large extent are superficial. Being exotic, they tend to impress us overmuch. Members of this college deal almost daily with colleagues from other lands. I trust you find a deep sameness in them. If

strated to be carcinogenic and to affect the genes. Genetic effects can be created with relatively light doses. The significance of such effects, however, is far from being completely evaluated.

Epidemiological studies are contributing to our knowledge of radiation effects. For example, physicians experience an incidence of leukemia 1.75 times as great as males in the general population (5). March has shown that the incidence of leukemia among nonradiologist physicians is 0.44 percent, while the incidence among radiologists is 4.47 percent (6). More recently, preliminary analysis of data from a survey of 547 children dying of leukemia and other malignant diseases in England during the period 1953-55 definitely indicates these conditions are most frequent among those whose mothers had X-ray examinations of the abdomen during pregnancy (7, 8).

Potential Effects of Radiation

The following explanation of what may happen when body tissue is irradiated, though greatly simplified and undoubtedly controversial from a technical viewpoint, is useful in discussing radiation injury.

Ionizing radiation produces within a body cell one or more pairs of electrically charged fragments called ions. The number of cells affected depends on the time and intensity of exposure, the volume of tissue exposed, and the character of the radiation. Radiation from external sources is relatively less consequential than radiation from sources lodged in the tissues.

Following the production of ions in a cell, an ion pair may simply recombine or other ion combinations may form. The former event is of little concern, but the latter may cause either alteration or destruction of the cell. Destruction of the cell may contribute to the phenomenon of aging, and the only result will be a shortening of the life span. Alteration of the cell may produce either a benign or a malignant mutation. A benign mutation is not of great concern in a somatic cell, but it could be important in a genetic cell. A malignant mutation may in time form cancerous tissue. Of the potential effects of radiation on body cells then, mutation is most important.

When tissues are exposed to any amount of ionizing radiation, some or all of these effects are possible. Even minimal exposure or background exposure from natural sources contributes to the probability of an untoward effect. Therefore, the theoretical goal in prevention of radiation injury should be limitation of exposure to the absolute minimum.

The National Research Council reports attribute an average accumulated dose of about 4.3 roentgens of external radiation over a 30-year period to background radiation not under man's control; 3 roentgens to the gonads from X-rays; and a projected 30-year external exposure from fallout from testing of weapons, if continued at present levels, of about 0.1 roentgen. (The probable internal exposure is not included in these calculations.) To these exposures must be added potential occupational exposures and exposures from diagnostic or therapeutic uses of radionuclides.

Medical exposure can be controlled by laboratory techniques and equipment put to judicious use. Occupational exposures can most certainly be approached from the viewpoint of preventive medicine.

The Armed Forces have two broad areas of interest in ionizing radiation protection. These are (a) the problems associated with nuclear weapons and reactors and (b) those not directly so associated. In the Army, the Surgeon General has a special assistant for nuclear energy, who deals primarily with tant. Matters pertaining to microwave hazards in medical radiology are within the purview of the chief radiological consultant. Matters pertaining to microwave hazards, nonmedical and nonweapons uses of emitters, and radiological hygiene surveys of Army installations are charged to the chief of the Preventive Medicine Division and are delegated to the Occupational Health Branch. In the newly developing field of nuclear reactors, all these people have important interests.

Scope of the Army's Problem

All of the Army's 1,025,000 military and about 435,000 civilian employees have radiographs taken as part of their preenlistment or preemployment physical examinations. Many

Preventing Injury From Radiation

By JOHN R. HALL, Jr., M.D., M.P.H.

INJURY from ionizing radiation is a phenomenon which, with the advent of nuclear physics, has squarely challenged practitioners of preventive medicine. The everyday uses of ionizing radiation from various natural and man-made emitters can result in low-level, chronic exposure, if not in inadvertent high-level exposure. Exposure to doses well below dramatic levels can result in slowly developing and currently irreversible adverse biological effects in present and future generations. At this time, virtually the only approach to limiting this potential toll is through preventive medicine. After-the-fact therapy is not now promising (1).

Rather than present an abstract, general discussion of radiation control, I should like to describe the policies and practices of the Army Surgeon General and his staff, which are applied daily throughout the world. The Army is keenly aware of the activities and contributions of other agencies and works closely with them. The Atomic Energy Commission, always a leader in this field, provides us with much information and guidance, and there are many projects that are joint endeavors of AEC and the Armed Forces. In addition, the National Bureau of Standards and the National Research Council, as well as other agencies, play important roles.

Early Medical Concern

The Army's concern with the problem of radiation injury is based on medical history since

Colonel Hall, in the Medical Corps of the U. S. Army, is chief of the Occupational Health Branch, Preventive Medicine Division, Office of the Surgeon General, Department of the Army.

Roentgen discovered X-rays in 1895, Becquerel discovered natural radioactivity in 1896, and the Curies isolated polonium and radium in 1897-98. That the potentially harmful effects of radiation were suspected early is borne out by the following quotation from American Martyrs to Science Through the Roentgen Rays (2): "Within a period of 90 days after Roentgen's 'Preliminary Communication,' suspicion was aroused in the minds of many investigators that X-rays, or something evolved in the production of X-rays, might have some ill effect on living tissues . . ." Becquerel accidentally burned the skin beneath his vest pocket in which he was carrying a vial of radium. The Curies, too, were burned by radium, Marie accidentally and Pierre deliberately as an experiment. And, as is well known, the deaths of Madame Curie and her daughter, Irène Joliot-Curie, have been attributed to effects of radiation. Madame Joliot-Curie was exposed in a laboratory accident, when she heroically attempted to confine the contents of a broken vial of an intensely active element while she warned her co-workers to flee.

Early concern with radiation injury has been augmented by continuing developments in fundamental and applied radiobiology. Recent reports of the National Research Council (3) concerning biological effects of radiations, which are closely paralleled by a report of the British Medical Research Council (4), have sharply emphasized the need of preventive action. The National Research Council reports describe the potentially harmful effects of ionizing radiation on this generation and on its posterity, thereby touching upon both the somatic and the genetic effects. They stress the cumulative aspects of chronic exposure, especially genetic. Ionizing radiations have been demon-

Protection of Army Personnel

Army regulations require individual dosimetry, or inventory, for all personnel in an environment heavily exposed to ionizing radiation (13). Accurate cumulative records must be kept in a manner prescribed by tri-service regulation (14). In continental United States, Army installations receive film badge service from the Lexington Signal Depot (15), which provides the badges and the film on an appropriate periodic schedule. Exposures above 300 milliroentgens per week are reported to the installation and to the Surgeon General by telegram or telephone. If gross or multiple over-exposures are indicated, technicians are sent to the installation to help pinpoint and correct the difficulty.

Many believe that the Army control measures are more severe than those of civilian counterparts. If so, it is only in adherence to common sense and to existing standards and regulations. We scrupulously observe the Atomic Energy Commission's requirements. We use the data of the various National Bureau of Standards handbooks, some of which we have borrowed wholly or in part and reissued as Army bulletins and directives. When newer information dictates or suggests modifications in these data, we publish and enforce the changes. We also issue publications specially developed for the Army.

The Army attempts to learn and comply with State and community requirements. In that respect, two pleas are in order. First, when regulations for a State or a locality are issued, we ask health officials please to send copies to the surgeons general of the three services. Second, we ask everyone to remember that the control of ionizing radiations is important to national health. As in motor vehicle or air control, maximum standardization of codes, symbols, marking, regulations, and restrictions is desirable. The practices of New York State, where National Bureau of Standards handbooks and related or similar documents and procedures are used extensively, are exemplary in this respect.

Summary

The Army's main concern with respect to prevention of radiation injury is the protection of

the individual against unnecessary exposure to ionizing radiation. We consider all ionizing radiations to be potentially harmful. Our approach is essentially preventive. We try to foresee the hazards, design protective facilities and procedures, keep accurate records of users and uses, provide maximum protective and monitoring devices at each installation, and then check by disinterested survey to assure local competence and adherence to prescribed procedures and to detect hazards otherwise overlooked. National and local monitoring and investigation of noteworthy exposure support this effort.

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receive additional exposure to X-rays in emergency or periodic examinations. The Army also operates induction stations for the three services. These activities employ hundreds of X-ray installations throughout the free world. These installations, utilizing a variety of machines acquired at various times and initially installed by various agencies and companies, are periodically serviced, calibrated, moved, and checked for radiological hazards. Although some of the work is done by operating personnel, the "disinterested" survey method also is used. This type of survey is conducted by personnel from the Army Environmental Health Laboratory, with the aid of outstanding consultants as necessary.

Six large Army hospitals use radionuclides for medical research and treatment, and a large number of laboratories, arsenals, and industrial-type installations use radioelements in nonmedical research and development, production, and training. Some sources used by the Army are in the order of tens and hundreds of curies in strength. All these must be monitored and surveyed periodically.

All Army users of radionuclides receive them through the standard byproduct procedures established by the Atomic Energy Commission (9), with the important exception that all requests must be transmitted through the Office of the Surgeon General. For approval by the Army Surgeon General, a request must show that proper receiving, handling, storage, and disposal facilities and adequately trained and experienced personnel are available. These trained persons assume responsibility for the radionuclides and supervise their use. The Army has excellent rapport with AEC and, in a sense, acts as its agent, although visiting AEC teams are always welcome to conduct checks on the Army's operations, either independently or in conjunction with our personnel.

Disposal of radioactive wastes, a responsibility of the Army Chemical Corps (10) with technical advice and supervision from the Surgeon General, is a major problem. Morton and Struxness of the Atomic Energy Commission have pointed out that it may well prove to be one of the limiting factors in achieving optimum benefits from nuclear energy (11). Relatively minute quantities of short half-lived

radionuclides may be admitted to the sewage system where this practice is allowed and under strict controls. Larger amounts may be stored in appropriate receptacles pending loss of activity. Among other methods tried or studied are burial at sea below the thermocline, at a depth of a thousand fathoms, after casting into concrete or incorporation into an insoluble ceramic mass; ground disposition in certain soils having available ion exchange patterns; and disposition in such natural containment formations as the salt formations in Michigan and Kansas, the regional aquifers in the midwest and the southwest, and the closed valleys in the west.

The Army also has betatrons, industrial X-ray machines, and high-activity radionuclides for industrial radiography or for processing military items. Some radionuclides are being used with considerable success for sterilization of packaged foodstuffs. The Army uses appreciable quantities of naturally occurring radionuclides, such as radium, over which the Atomic Energy Commission now extends no control. The Army has established administrative controls for these materials similar to those for other radioactive substances (12).

In cooperation with the other armed services and the Atomic Energy Commission, the Army is now moving into the nuclear reactor field. Our first reactor, water moderated and designed to develop electric power and heat, has recently been completed at Fort Belvoir, Va., near Washington, D. C. This reactor, because it is near a population center, is in a building designed, according to AEC standards, to contain fully any contamination from radionuclides. The design conforms also with recommendations of the National Research Council (3a).

An ultimate goal for the Army in this field is an easily transported or even mobile reactor to provide heat and power in remote areas of the world where logistics of conventional fuel supply are burdensome and costly. Currently, the Army is on the threshold of this goal with a stationary prototype and can be expected to move rapidly into various applications with the accumulation of knowledge and experience. The Army Medical Service expects medical problems from power reactors to grow and is preparing for that eventuality.

Identification of Two Leptospiral Serotypes New to the United States

By MILDRED M. GALTON, DOROTHY K. POWERS, STURGIS MCKEEVER,
and GEORGE W. GORMAN

RECENTLY, two leptospiral serotypes not found previously in the United States were isolated from the kidneys of wild animals collected in southwest Georgia (1). The identity of these two serotypes, one a member of the *mitis-hyos* serogroup, the other belonging to the *australis* A serogroup, is recorded in this paper.

Relatively few leptospiral serotypes have been isolated in the United States, probably because of the limited number of medical and veterinary laboratories providing appropriate diagnostic service. *Leptospira icterohemorrhagiae*, the first serotype isolated in this country, was obtained from wild rats in 1917 (2) and from man in 1922 (3). Since that time, four other serotypes, *Leptospira canicola* (4, 5), *Leptospira pomona* (6-8), *Leptospira autumnalis* Fort Bragg (9), and *Leptospira ballum* (10), have been identified in the United States. Serologic evidence has indicated that infection with strains related to *Leptospira bataviae* (11), *Leptospira sejroe* (12, 13), *Leptospira grippotyphosa* (14), and *Leptospira pyrogenes* (15) may exist, but these serotypes have not been isolated.

The authors are with the Communicable Disease Center, Public Health Service. Mrs. Galton, of the Epidemiology Branch, is bacteriologist in charge, Leptospirosis Research Laboratory, Chamblee, Ga. Mrs. Powers, now retired, was formerly a bacteriologist with that laboratory. Dr. McKeever, a biologist, and Mr. Gorman, a bacteriologist, are with the Technology Branch and are assigned to the Newton Field Station in Georgia.

Four of the cultures of leptospirae included in this study were isolated from the kidneys of opossums trapped on two plantations in Baker and Dougherty Counties, Ga., in September and October 1955. These were designated LT79, LT81, LT82, and LT85. Two additional cultures, designated LT95 and LT102, were isolated from the kidneys of two raccoons trapped on a plantation in Decatur County, Ga. All cultures were tested first against immune sera of *L. autumnalis*, *L. ballum*, *L. canicola*, *L. icterohemorrhagiae*, *L. pomona*, and *L. sejroe*, the usual battery used to test leptospiral isolations received from the Communicable Disease Center field station in Newton, Ga., and then with immune sera representative of the remaining 14 serogroups.

Procedures

Preparation of antisera. Immune sera were prepared by intravenous inoculation of normal rabbits weighing 8-9 lbs. with successive doses of 1.0-ml., 4.0-ml., 4.0-ml., and 6.0-ml. amounts of a 4- to 6-day-old culture of each leptospiral strain grown in Stuart's medium (16) and killed by the addition of 0.3 percent formalin. The 4 injections were given at 5- and 7-day intervals. Seven days after the last inoculation the rabbits were bled from the heart. Serum yield averaged 75 ml. per rabbit. After the addition of 50 percent glycerine as a preservative, the sera were stored at 40° F.

Preparation of antigens. Leptospiral strains used for antigen production were maintained in

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technical publications

Health and Demography

PHS Publication No. 502. 1956. By Halbert L. Dunn, M.D. 94 pages; illustrated. 50 cents.

Population trends and developments pertinent to present and future public health programs have been collated in this graphic presentation.

The condensed data are presented in five sections: the dynamics of population trends in the United States; population trends for major geographic areas and States; population characteristics; age and marital status; economic status and indicators of health and disease. A foreword and a postscript present the views of the author.

Directory of State Standard-Setting Authorities for Hospitals and Medical Facilities

PHS Publication (unnumbered). 10 pages. 1956.

This publication entitled "Directory of State Agencies Having Primary Legal Responsibility for Standards of Maintenance and Operation of Hospitals, Nursing Homes, Homes for the Aged, and Other Similar Facilities Except Those Operated by Federal and State Governments" briefly shows in tabular form the responsibilities of various State

agencies administering or licensing seven types of medical facilities. An accompanying index lists names and addresses of these agencies.

Intended as an aid to State, local, and other health agencies in planning and administering their programs, this pamphlet was published by the Division of Hospital and Medical Facilities (administering body of the Hill-Burton Hospital and Medical Facilities Survey and Construction Program).

Industrial Waste Guide to the Commercial Laundering Industry

PHS Publication No. 509. 1956. 8 pages; illustrated. 15 cents.

Intended primarily to aid workers in the water pollution control program, this handbook was prepared by the Stream Pollution Abatement Committee of the American Association of Textile Chemists and Colorists in cooperation with the American Institute of Laundering. It was submitted for publication to the Public Health Service through the National Technical Task Committee on Industrial Wastes.

Laundry supervisors will find this publication a concise practical guide for operation of washrooms with a minimum of waste material. A section on waste treatment suggests possible solutions to stream pollution which cannot be corrected by waste reduction procedures. Some

performance data are included on various waste treatment processes. The value of waste reduction methods in lowering total waste treatment costs also is emphasized.

The Circulatory System Illustrated Guide for Nursing Education

PHS Publication No. 482. 1956. 67 pages; illustrated. 35 cents.

Designed for nursing education in cardiovascular disease, this booklet contains 20 colored diagrammatic figures with explanatory text.

This guide is also intended as a timesaver for nursing school instructors, for individual nurses, and for staff education in hospitals, industry, and public health agencies.

The schematic drawings used are reproductions from the set of colored slides on the circulatory system, produced in 1954 by the Public Health Service, and used widely in nursing education.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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Preparation of antisera. Immune sera were prepared by intravenous inoculation of normal rabbits weighing 8-9 lbs. with successive doses of 1.0-ml., 4.0-ml., 4.0-ml., and 6.0-ml. amounts of a 4- to 6-day-old culture of each leptospiral strain grown in Stuart's medium (16) and killed by the addition of 0.3 percent formalin. The 4 injections were given at 5- and 7-day intervals. Seven days after the last inoculation the rabbits were bled from the heart. Serum yield averaged 75 ml. per rabbit. After the addition of 50 percent glycerine as a preservative, the sera were stored at 40° F.

Preparation of antigens. Leptospiral strains used for antigen production were maintained in

Stuart's medium and transferred twice weekly. Such actively growing seed cultures were used in approximately 1:10 to inoculate the desired amount of Stuart's medium in screw-capped prescription bottles. The inoculated bottles were incubated 4-5 days at 28°-30° C. and then examined by dark-ground microscopy for density and smoothness. If the antigens appeared satisfactory, 0.3 percent formalin was added, and they were allowed to stand overnight at room temperature. They were centrifuged for 10 minutes at a speed of 1,500× gravity (about 3,000 r.p.m. on a No. 1 International Centrifuge) to remove debris or precipitate. The supernatant was decanted and was then ready for use.

Agglutination test procedure. Serial two-fold dilutions of serum in 0.85 percent saline, starting with 1:8 through 1:32,768, in a final volume of 0.2 ml. were prepared. To each serum dilution, 0.2 ml. of antigen was added. The tubes were shaken, incubated in a water bath at 52° C. for 2 hours, and then refrigerated for 1 hour. A drop from each tube was examined by dark-ground microscopy using low-power objective, and 10× oculars without a coverslip. The degree of agglutination was read as 1 plus, 2 plus, 3 plus, 4 plus, or negative. A reaction was recorded as 4 plus when all leptospire appeared clumped, 3 plus when approximately 75 percent of the organisms were agglutinated, 2 plus with 50 percent agglutinated, and 1 plus with 25 percent agglutinated. The end point was taken as the last dilution showing a 1 plus reaction.

Agglutinin absorption procedure. Antigens for absorption studies were prepared from 5- to 6-day-old cultures grown in Stuart's medium and killed by the addition of 0.3 percent formalin. After standing at room temperature overnight, the cultures were centrifuged for 10 minutes at 1,500 × gravity to remove extraneous material. Ten to twenty milliliters of the supernatant were put aside to be used later as antigen for testing the absorbed serum. The remainder of the supernatant was centrifuged for 15 minutes at 9,000 × gravity in a Servall. The supernatant was discarded, and the desired amount of a 1:20 dilution of serum was added to the packed cells. The cells were resuspended using a 2.0-ml. Cornwall pipette

with a 4-inch, 17-gauge needle. After incubation of the serum-cell mixture in a 50° C. water bath for 2 hours and overnight at 28°-30° C., the cells were removed by centrifugation and the serums absorbed a second time by the same procedure but without overnight incubation. If necessary, a third absorption was carried out. Absorptions were considered complete when agglutinins were completely removed by the homologous antigen. Microscopic agglutination tests with the absorbed serums were performed by the procedure described above except that the initial dilution was 1:40.

Findings

None of the cultures in this study agglutinated when tested against the usual battery of leptospiral immune serums.

The mitis-hyos serogroup strains. Culture LT79 was agglutinated by *Leptospira mitis* Johnson antiserum to 25 percent of the titer, by *Leptospira hyos* antiserum to 6 percent of the titer, by *L. bataviae* antiserum to 3 percent of the titer, and by *L. pyrogenes* antiserum to less than 1 percent of the titer. An antiserum prepared against strain LT79 agglutinated to the homologous titer *L. mitis* and *L. hyos* antigens. Cross agglutinin absorption tests performed with *L. mitis* and *L. hyos* indicated that LT79 is closely related to both strains but not antigenically identical with either, as shown in table 1. (A subculture was sent to Col. Maurice Hale, Division of Veterinary Medicine, Walter Reed Army Institute of Research, Washington, D. C., who confirmed our findings.) This new serotype is tentatively designated *Leptospira bakeri*.

According to Wolff (17), the retention of at least 10 percent of the homologous titer is the criterion for heterologous strains. Alexander and his co-workers (18) modified Wolff's scheme slightly to conform to their dilution scheme and considered 6.2 percent ($\frac{1}{16}$ of homologous titer) as the breakpoint for a heterologous serotype.

Culture LT85 also was agglutinated to 25 percent of the titer by *L. mitis* antiserum. It reacted to the homologous titer with LT79 antiserum, and in absorption tests it completely removed the agglutinins for LT79. Absorption

Table 1. Results of cross agglutinin absorption tests with LT79, *Leptospira hyos*, and *Leptospira mitis* Johnson¹

| Antiserum | Antigen | | |
|-------------------------|------------------|------------------|------------------|
| | <i>L. hyos</i> | <i>L. mitis</i> | LT79 |
| <i>Leptospira hyos</i> | | | |
| Unabsorbed..... | 16, 768 | 16, 768 | 1, 024 |
| Absorbed with: | | | |
| <i>L. hyos</i> | (²) | (²) | (²) |
| <i>L. mitis</i> | 640 | (²) | (²) |
| LT79..... | 5, 120 | 5, 120 | (²) |
| <i>Leptospira mitis</i> | | | |
| Unabsorbed..... | 4, 096 | 4, 096 | 1, 024 |
| Absorbed with: | | | |
| <i>L. hyos</i> | (²) | (²) | (²) |
| <i>L. mitis</i> | (²) | (²) | (²) |
| LT79..... | 640 | 640 | (²) |
| LT79 | | | |
| Unabsorbed..... | 4, 096 | 4, 096 | 4, 096 |
| Absorbed with: | | | |
| <i>L. hyos</i> | (²) | (²) | 80 |
| <i>L. mitis</i> | (²) | (²) | 40 |
| LT79..... | (²) | (²) | (²) |

¹ Titer expressed as reciprocal of serum dilution.

² No reaction in a 1:40 dilution.

studies indicate that LT79 and LT85 are homologous serotypes.

The other two cultures in this group, LT81 and LT82, appear to be related to the *mitis-hyos* serogroup and to the two new isolates but are not identical with either, as shown in table 2. When LT79 antiserum was absorbed with LT81 and LT82 antigens, these antigens failed to remove the homologous agglutinins by 15 percent. In the initial agglutination tests LT81 reacted to 25 percent of the titer of *L. mitis* antiserum, but LT82 reacted to only 6 percent. Thus, further serologic study is needed to determine the exact relationship of these two strains.

The australis A serogroup strains. Cultures LT95 and LT102 were agglutinated to the homologous titer with *Leptospira australis* A Ballico antiserum. An antiserum prepared against LT95 agglutinated the Ballico strain to 12½ percent of its homologous titer. As shown in table 3, absorption studies revealed that Ballico serum retained 2 percent of its titer when absorbed with LT95 cells, and LT95

serum retained only 1 percent of its titer when absorbed with Ballico cells. Thus, except for minor differences, LT95 is indistinguishable from *L. australis* A Ballico.

Comment

L. mitis was isolated first by Johnson (19) in 1940 in Australia from humans with benign leptospirosis. All patients had been in contact with pigs or cattle. It has been isolated since from pigs (20) in Australia, and serologic evidence suggests that infections occur in cattle. Clinically and epidemiologically, *L. mitis* infection closely resembles *L. pomona* infection.

L. hyos was isolated by Savino and Rennella (21) from humans with mild leptospirosis and from swine in Argentina. Babudieri (22) studied both the *L. mitis* Johnson and the *L. hyos* strains and reported that they were serologically identical. However, further examination of these strains by A. D. Alexander, Walter Reed Army Institute of Research, showed that *L. hyos* is a complete biotype of *L. mitis* Johnson. The results of the present study substantiate Alexander's observations.

L. australis A was identified by Lumley (23) in 1937 from canefield workers in Queensland. Clinical symptoms were reported to be severe. Stagnant water in the canefields yielded the organisms, and a native rat (*Rattus conatus*) was

Table 2. Results of agglutination and cross agglutinin absorption tests with *Leptospira mitis* Johnson, LT79, LT81, LT82, and LT85¹

| Antiserum | Antigen | | | |
|-------------------------|------------------|------------------|------------------|------------------|
| | LT79 | LT81 | LT82 | LT85 |
| <i>Leptospira mitis</i> | | | | |
| Unabsorbed..... | 1, 024 | 1, 024 | 256 | 1, 024 |
| LT79 | | | | |
| Unabsorbed..... | 1, 096 | 256 | 256 | 1, 096 |
| Absorbed with: | | | | |
| LT81..... | 640 | (²) | - | - |
| LT82..... | 640 | - | (²) | - |
| LT85..... | (²) | - | - | (²) |

¹ Titer expressed as reciprocal of serum dilution.

² No reaction in a 1:40 dilution.

Table 3. Results of cross agglutinin absorption tests with *Leptospira australis* A Ballico, LT95 and LT102¹

| Antiserum | Antigen | | |
|---------------------------------------|------------------|------------------|------------------|
| | Ballico | LT95 | LT102 |
| <i>Leptospira australis</i> A Ballico | | | |
| Unabsorbed..... | 2, 018 | 2, 048 | 2, 018 |
| Absorbed with: | | | |
| Ballico..... | (²) | (²) | (²) |
| LT95..... | 40 | 40 | ----- |
| LT95 | | | |
| Unabsorbed..... | 1, 024 | 8, 192 | 8, 192 |
| Absorbed with: | | | |
| Ballico..... | (²) | 80 | ----- |
| LT95..... | (²) | (²) | ----- |
| LT102..... | ----- | (²) | (²) |

¹ Titer expressed as reciprocal of serum dilution.

² No reaction in a 1:40 dilution.

found to be the principal animal carrier. Recently, two additional strains of the *australis* A serogroup have been found, one in Australia (24) and the other in Malaya, according to Alexander. Further studies with these and with the isolations from raccoons will be done to determine the exact relationships.

The identification of these strains in the United States further emphasizes the importance of serotyping all leptospirae isolated. In addition, inclusion of *L. mitis* or *L. hyos* and *L. australis* A cultures in the battery of antigens employed in the agglutination and agglutination lysis tests in diagnostic medical and veterinary laboratories must now be considered.

Summary

Four strains of leptospirae isolated from opossums, belonging to the *mitis-hyos* serogroup, and 2 strains from raccoons, belonging to the *australis* A serogroup, have been identified. Cross agglutinin absorption studies indicate that the opossum strains are not identical with *Leptospira mitis* Johnson or *Leptospira hyos*, but that they represent at least one new serotype, tentatively designated *Leptospira bakeri*, within the serogroup and possibly one other serotype. Further studies are being done to determine the exact relationships.

Two cultures from raccoons were shown by cross agglutinin absorption studies with *Leptospira australis* A Ballico to be within the range considered acceptable for homologous serotypes.

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Since this work was completed, we have learned of a new serotype of the *mitis-hyos* group. The new leptospiral serotype, designated Kisuba, was isolated in the Belgian Congo (25). The tentative designation of LT79 as *Leptospira bakeri* is suggested until its relationship with strain Kisuba is established.

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Advisory Committee

Surgeon General Leroy E. Burney has appointed a committee of physicians to advise him on Public Health Service activities related to the practice of medicine. The first meeting of the new Advisory Committee on Medical Practice Relations was held on April 4-5, 1957, in Washington, D. C.

Dr. Burney said that with the growth of medical and related research, it has become increasingly important to work with private physicians as well as with health agencies in applying new knowledge promptly and effectively.

Members of the committee are Dr. Stuart Adler, Albuquerque, N. Mex.; Dr. C. Byron Blaisdell, Asbury Park, N. J.; Dr. Hugh H. Hussey, Washington, D. C.; Dr. W. L. Porttens, Franklin, Ind.; Dr. Julian P. Price, Florence, S. C.; Dr. Stanley R. Truman, Oakland, Calif.; and Dr. William B. Walsh, Washington, D. C.

Table 3. Results of cross agglutinin absorption tests with *Leptospira australis* A Ballico, LT95 and LT102¹

| Antiserum | Antigen | | |
|---------------------------------------|---------|--------|--------|
| | Ballico | LT95 | LT102 |
| <i>Leptospira australis</i> A Ballico | | | |
| Unabsorbed..... | 2, 048 | 2, 048 | 2 048 |
| Absorbed with: | | | |
| Ballico..... | (?) | (?) | (?) |
| LT95..... | 40 | 40 | ----- |
| LT95 | | | |
| Unabsorbed..... | 1, 024 | 8, 192 | 8, 192 |
| Absorbed with: | | | |
| Ballico..... | (?) | 80 | ----- |
| LT95..... | (?) | (?) | ----- |
| LT102..... | ----- | (?) | (?) |

¹ Titer expressed as reciprocal of serum dilution

² No reaction in a 1:40 dilution

found to be the principal animal carrier. Recently, two additional strains of the *australis* A serogroup have been found, one in Australia (24) and the other in Malaya, according to Alexander. Further studies with these and with the isolations from raccoons will be done to determine the exact relationships.

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The picture was similar in 1954-55, when only 26 (37 percent) of the 71 available appointments were filled: 21 of the 65 first-year appointments available and 5 of the 6 second-year appointments.

Why so small a percentage of the available residencies are filled is inexplicable. Perhaps too few physicians have been told about the program.

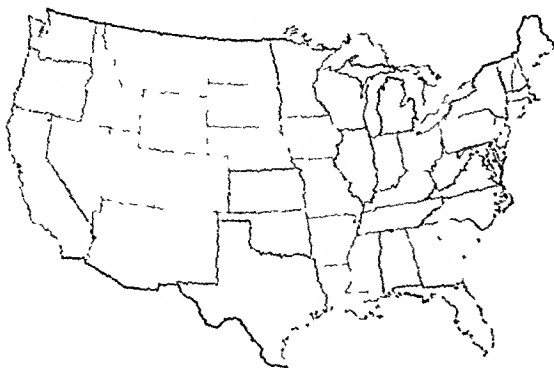
Seattle-King County Program

The Seattle-King County Department of Public Health in Washington has sponsored a residency program in public health since 1952. Our experiences may be of interest to the profession at large as well as to those who are personally involved in postgraduate medical education.

The program adopted by the Seattle-King County Department of Public Health in 1952 began with one resident who, quite literally, had to "play by ear." After completing 1 or 2 months' time in a given service, he selected another for his next assignment. His notes and special studies helped the department to correct some of the deficiencies of the program and to see where the resident would profit by additional supervision or advice. The lack of a basic curriculum was perhaps the worst fault of the first year.

A second candidate, accepted in 1953, left for a residency in surgery before he had finished training. Perhaps we erred in not scrutinizing the intentions and qualifications of the applicant with sufficient care.

States with residencies in public health and preventive medicine, 81 positions, 1956.



Two residents were accepted for 1954. Their work together in activities that consisted mostly of observation and study enabled them to talk over the experiences of the day, make plans for the next week's program, and, when necessary, bolster one another's morale. A schedule assured their spending a definite period of time in each service. During the remainder of the year, the residents were assigned to a district office where they assumed responsibility gradually as their experience and knowledge accumulated. This arrangement proved so satisfactory that two additional residents were accepted in 1955.

Curriculum

The men who have participated in our program as residents have come to us from the hectic and demanding routines of internship or private practice where they were preoccupied with problems of individual patients. To change their professional frame of reference so that they see an entire community as their patient requires time, study, and some degree of personal reorientation as well as specific instruction in technical disciplines. Therefore, the resident's curriculum is designed to present fundamental disciplines of preventive medicine and public health during the first 6 months. At the same time it is sufficiently flexible and leisurely to enable the resident to take advantage of training opportunities that may arise outside the health department, such as special courses at the University of Washington or those sponsored by other agencies, public health meetings, and conferences with visiting experts.

Our curriculum consists of the following four basic subjects:

| | Months |
|-----------------------------------|--------|
| Public health administration..... | 1 |
| Community resources..... | 1 |
| Preventive medicine..... | 2 |
| Environmental sanitation..... | 2 |

Public Health Administration

From the beginning, the director of public health has supervised the residents during their first 2 months in the health department. No one is in a better position to introduce the resi-

Public Health Residency Training

By S. P. LEHMAN, M.D., M.P.H., and D. R. PETERSON, M.D.

I DIDN'T KNOW there was such a thing." We have heard this statement repeatedly from intern and practicing physician alike. The "thing" they refer to is the residency program in public health. While residencies in clinical specialties are well known and accepted, such is not the case in the field of public health. Perhaps this is because the specialty is only about 8 years old. By June 30, 1956, only 1,684 certificates had been awarded in public health.

Residencies for physicians interested in public health as a specialty have evolved since the incorporation of the American Board of Preventive Medicine and Public Health in 1948. The board was formed on the recommendation of a joint committee of the American Medical Association and of the American Public Health Association. It was created in accordance with action of the Advisory Board for the Medical Specialties and was recognized and approved as a medical specialty board by the Council on Medical Education and Hospitals of the American Medical Association in 1949 (1). The purpose of the board is twofold:

- To encourage the study, improve the practice, elevate the standards, and advance the cause of preventive medicine.

- To grant and issue to physicians, duly licensed by law to practice medicine, certificates of special knowledge in the various fields of preventive medicine. The fields in which certification is granted are public health, aviation medicine, and occupational medicine.

Dr. Lehman and Dr. Peterson are with the Seattle-King County Department of Public Health, Seattle, Wash. Dr. Lehman is director of the department, and Dr. Peterson, a former public health resident with the department, is a district health officer.

To be eligible for examination by the American Board of Preventive Medicine, candidates must meet certain general requirements. These pertain to character, professional demeanor, medical education, internship, and medical licensure. Additional requirements for public health candidates are:

1. Successful completion (after internship) of at least 1 academic year of graduate study leading to the degree of master of public health or an equivalent degree or diploma; or training or study decreed by the board to be substantially equivalent to such graduate study.

2. Residency (after internship) of at least 2 years of field experience in general public health practice, which includes planned instruction, observation, and active participation in a comprehensive, organized public health program. 1 year of which may be an approved clinical residency in a field directly related to public health.

3. A period (after internship) of not less than 3 years, in addition to 1 and 2 above, of special training in, or teaching or practice of, public health.

4. Limitation of practice to full-time teaching or practice of public health as a specialty.

In 1955-56 the Residency Review Committee for Preventive Medicine and Public Health (2) had approved residency programs for 2 years of field training in 15 States (see map). In 12 States, 35 local areas were designated as satisfactory for field training; 2 were approved on a statewide basis; and 1 was given provisional approval.

Through a questionnaire sent in September 1956 to all the States known to have a program, we learned that 42 residents had been trained since 1950; 26, or 62 percent, of these residents were doing full-time public health work. Sixty-three appointments were available, but only 19 (30 percent) were filled (see table).

offers the resident insight into the productive teamwork of the astute clinician and the special investigator. The unique records (example: nickname file), the conduct of the clinic, the examination of patients, the special training of the investigators, and the occasional positive dark field examination are some of the highlights of this service.

Environmental Sanitation

A large departmentalized sanitation division affords the residents ample opportunity to see this aspect of public health practice at first hand with a well-qualified person to instruct them. A typical experience in the milk section, for an example, includes an early morning briefing in the main office, followed by a visit to the farm, milk receiving plant, milk processing plant, and then, perhaps, to the laboratory to witness the elucidation of a consumer complaint. Technical factors influencing grade, control of pasteurizing equipment, public relations with milk producers, and a host of other problems are explained. To illustrate the geographic differences in the program, the resident is taken to several areas in this milkshed, which literally surrounds the entire Puget Sound.

This same general type of instruction is given in the other sections: general sanitation, meat, plumbing, plague and vermin control, sewerage installations, and water works. It is in the sanitation division that the resident gets a better view of public health work at its grass roots level than anywhere else.

Completion of Training

Following his indoctrination, the resident is assigned to one of three district health offices situated strategically on the periphery of the metropolitan area. Each district health office serves both a rural and an urban population, with public health problems which are, we feel, representative of those he might expect to meet in the future.

He can confer with experienced personnel on any problem that he feels he cannot solve by himself. Moreover, since his tenure in this post is about 21 months, he has sufficient opportunity

to become established in the community and to learn the elements of public relations which, in our area at present, involve participation with local health councils, municipal organizations of many descriptions, school personnel, radio and newspaper representatives, and similar groups. As often as is practical and within budgetary limitations, this resident, now a district health officer, is encouraged to attend both local and national meetings of public health workers in order that he may better identify himself with this group of medical specialists.

After some 27 months with this health department, the resident attends a school of public health of his own choosing. While at school he is given a monthly stipend as well as tuition and travel funds. When he has completed his academic work and received the master of public health degree, or its equivalent, the resident has fulfilled the formal training requirements of the American Board of Preventive Medicine.

Comments

Inherent in a residency program are features that benefit both resident and health department. How these are integrated into the operation to maintain an equitable balance between values received by each is shown in the inset.

We have been fortunate in getting physician applicants with varied backgrounds. Two had worked in health departments previously, one as a sanitarian and the other as a statistician. Others have come directly from internship, from military service, or from private practice. These men have been intent on making public health a career. Like their counterparts in the clinical specialties, they hope to become accredited specialists in their chosen field. They anticipate training that will enable them to act as consultants to physician and layman alike in medical matters that pertain to the community. The excellent scholastic records of our residents who have matriculated in schools of public health attest to the seriousness of their intentions. We like to feel that careful selection of candidates and broad practical field training contribute to this achievement.

After basic orientation each resident sets his own pace in assuming responsibility for clinics, programs, and planning. However,

dents to the health department personnel, to the community, and to the history, resources, and peculiarities of the area in which they will work.

From the vantage point of the director's office, the residents see the whole operation, though they are not necessarily expected to understand the significance of all that they see during this first exposure. They are included in staff conferences, committee meetings, discussions of personnel problems, hearings before the city council, and discussions of proposed ordinances and other related business of the department, with the anticipation that they will catch the "sense" of what is going on. Inter-staff committee work, writing assignments, helping with correspondence, and similar activities of routine office management help them relate to the organization and feel that they are on the team from the start.

Community Resources

Knowing the community is to the public health physician what knowing anatomy is to the surgeon. Here again the director, with his experience and knowledge, can point out the more important community resources within his jurisdiction. The residents then take the initiative in visiting as many of these organizations as time permits. Among these organizations are other official public health agencies, various volunteer health organizations, industrial medical departments, prepaid medical service organizations, hospitals, group practice clinics, the juvenile court with its satellite service groups, jails, a screening-examination center, and medical rehabilitation facilities. Other governmental organizations, Federal, State, and local, complete the itinerary.

Preventive Medicine

The preventive medicine portion of the curriculum represents more or less familiar ground to the residents and offers them an opportunity to exercise some of the talents developed by their hard-won medical education and experience.

Approximately 3 weeks are devoted to tuberculosis control. Under supervision, trainees participate in outpatient clinics and review the

Status of appointments in 14 public health residency programs, 1956

| Appointments | Number available | Filled | |
|---------------|------------------|--------|---------|
| | | Number | Percent |
| Total..... | 63 | 19 | 30 |
| 1st year..... | 35 | 7 | 20 |
| 2d year..... | 28 | 12 | 45 |

miniature films taken by the various mobile X-ray units. They accompany the State tuberculosis control officer, or his deputies, to other health departments to observe the conduct of outlying clinics and consultations. They are invited to staff meetings at the sanatoriums and are urged to attend whatever professional meetings are being held at the time.

Well-child clinics are held throughout the local health department's jurisdiction. The residents are expected to staff some of these clinics and to familiarize themselves with the type of service offered. Special projects and courses have been devised to help them comprehend the concepts of child health and the significance of morbidity and mortality statistics. Programs for crippled children, for sight and hearing conservation, and for medical care for children are included in their assignments. They are also urged to attend the clinical presentations at the University of Washington or the Children's Orthopedic Hospital and to study the operation of the newly formed poison control center.

Through worn shoe leather and perseverance the aspiring health physician learns the elements of communicable disease control and epidemiology, for he is asked to assume responsibility for making appropriate investigations when indicated. The facilities of all the hospitals that accept communicable disease cases are available in the event of an unusual or interesting case or outbreak. Practical problems of disease reporting, levels of community immunizations, cooperation with other official departments, control regulations and their enforcement, to mention only a few, point up some of the challenges of this aspect of preventive medicine to the residents.

The special case of venereal disease control

Conjunctivitis in Southwest Georgia

By RICHARD P. DOW, Ph.D., and VIRGINIA D. HINES, B.S.

ACUTE CONJUNCTIVITIS, commonly known as "sore eyes," is endemic in various sections of the southern United States. The disease erupts seasonally, reaching high levels of prevalence each summer. Its incidence seems closely related to the seasonal and geographic abundance of "eye gnats" of the genus *Hippelates*. Because of this association, *Hippelates* is not unreasonably considered as a possible vector of conjunctivitis.

The disease occurs mostly in younger children, in uncomplicated cases without any known sequelae. In this country it does not appear to be associated with the spread of trachoma. On the other hand, in a region such as southwest Georgia, where conjunctivitis is endemic, it is a cause of much illness. Most rural preschool children have at least one case of conjunctivitis each summer, and among older children, the disease is a cause of much school absenteeism during the fall (1).

Studies in the Rio Grande Valley in Texas indicated that most cases of sore eyes in that area were due to *Haemophilus aegyptius*, the Koch-Weeks bacillus (2, 3). Additional unpublished studies conducted by Dr. Dorland J. Davis of the Public Health Service demonstrated similar etiology in the vicinity of Thomasville, Ga. Here the Koch-Weeks organism was found to exhibit seasonal abundance corresponding to that of observed sore eyes and

also to occur more frequently than *Haemophilus influenzae* in cultures of eyes having signs of conjunctivitis.

Collection and Analysis of Data

The present paper describes a house-to-house epidemiological study of conjunctivitis in the rural town of Barwick, Ga., near Thomasville. The field observations were made between May 17 and October 29, 1951. The study population of 486 persons included nearly every family within a mile of the Barwick railroad station and was fairly evenly distributed between white and Negro persons and between the sexes. Children less than 15 years of age included 33 white males, 49 white females, 45 Negro males, and 51 Negro females. The families were first visited in two groups: one group on May 17th and 18th and the other on June 5th and 6th. Thereafter each group was visited alternately at 2-week intervals except for one 3-week interval in October.

During the house-to-house visiting, information on eye symptoms and on cases of sore eyes was elicited for each member of the family. The informant was usually the mother or another woman tending the household. No cultures were taken, but the eyes of every available person were examined for signs of conjunctivitis.

For the analysis of the data from this study, a case of conjunctivitis is defined as an illness which was called conjunctivitis or sore eyes by either the observer or the informant. Ages are fixed at the number of whole years of age at the end of July 1951. This procedure leads to some inaccuracy but most of the observations still fall within the correct year of age. Case

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Balance in Benefits

Resident «—————» Health Department

| | |
|---|---|
| AMA-approved postgraduate training | Stable, well-trained medical staff |
| Increasing responsibility and status | Relief of regular staff (members) |
| Contact with professional colleagues | Improved relations with doctors and hospitals |
| Reasonable salary for family maintenance | Just compensation for service |
| Association with University Medical School | Recruitment and teaching responsibilities met |
| Modest research activity and special projects | Results of research sometimes applicable |

competent advice is no farther away than the telephone. At a time when the resident's convictions concerning his chosen specialty may be conditional, supervision of this nature mitigates against discouraging mistakes without suppressing initiative. As the resident's capabilities become apparent, responsibility can be delegated in areas that will relieve some of the regular staff.

The resident must become a part of his community and win the confidence of his professional colleagues in that community. He is encouraged to join the medical society and other organizations relevant to his position as district health officer. This representation personalizes the health department on a district level and brings its programs closer to the communities for which they are intended.

Our initial stipend is \$500 per month the first year. The resident through his work in clinics, immunization programs, and other activities actually earns his stipend as much as the hospital resident who performs as house physician. Consistent with increasing responsibility and ability, the stipend is raised to \$800 per month the second year.

Each resident is appointed assistant clinical instructor in public health at the University of Washington Medical School. In this capacity he is expected to assist in teaching public health to medical students and to participate in special seminars and courses, all of which help to fix concepts and material in his mind that he has only recently learned himself. If, by precept

or example, a student is encouraged to choose public health as a career, the resident contributes to recruitment of personnel.

Project activity in our residency program has been both diverse and productive. Residents have contributed significantly to the following: civil defense and disaster preparedness program; publication of a public health reference manual for physicians; poliomyelitis survey; poliomyelitis immunization program; district office administration; investigation of a multiple-puncture tuberculin test (Heaf test); medical consultation for State vocational rehabilitation division.

We have been asked whether a physician with public health experience but without formal training should undertake a residency such as ours. We cannot answer this question categorically, for some physicians have been interested in the orientation part of our program. Certainly a new staff member could profit from thorough orientation to our community and the department. However, our program is primarily designed for training the uninitiated physician in the disciplines he will find essential to his pursuit of a career in public health.

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Table 2. Conjunctivitis case attack rates and percentages of children affected in white and Negro populations, May 17–October 29, 1951

| Age (years) | Case attack rates | | Percentages of persons affected | | |
|-------------|-------------------|-------|---------------------------------|-------|----------------|
| | White | Negro | White | Negro | P ¹ |
| Less than 1 | 4.8 | 5.6 | 43 | 31 | > .90 |
| 1–4 | 16.2 | 7.4 | 81 | 49 | < .02 |
| 5–9 | 7.7 | 3.9 | 58 | 27 | .05 |
| 10–14 | 1.2 | 2.2 | 11 | 19 | > .80 |

¹ Probability of null hypothesis (that no difference exists between the percentages for whites and Negroes).

Since it is often a matter of opinion as to when one case has recovered and another has begun, the number of separate cases is a less objective figure than the number of persons affected by sore eyes. The numbers of whites and Negroes who were affected and the numbers who were not affected at some time in the course of the study can be compared by fourfold analysis. This method shows that the proportion of white children attacked by sore eyes is significantly higher than the proportion of Negro children in the age groups 1–4 and 5–9 years (table 2). When the numbers of male and female children affected and not affected by sore eyes are similarly compared, the results again reflect the case rates, and there is no evidence of a difference in rates between the sexes.

Duration of Illness

The finding of differences in attack rates between the white and Negro children led to a study of other differences in the two groups. Besides 11 cases of conjunctivitis for which total length was not recorded and 7 cases which may or may not have been recovered on the day of the last pertinent interview, there are 46 recovered cases and 60 cases last reported as active. In Negroes, the cases are of longer average duration whether or not they were active at the time of the last interview, and this is true even if cases of 14 or more days' duration are excluded (table 4). Moreover, 16 of the 22 cases reported to have lasted 2 weeks or longer are in Negroes.

That these figures on duration of illness are

more or less typical of the disease in southwest Georgia is indicated by data on sore eyes collected in 1949 and 1950 during case history studies of diarrhea. In this study, several workers making house visits in the same general area conducted interviews at monthly intervals in 10 different communities in Thomas, Brooks, and Colquitt Counties (4). As in the 1951 data, the average duration of all recovered cases of sore eyes was shorter in white persons than in Negroes: 9.6 and 11.0 days, respectively. The average duration of those recovered cases which lasted less than 14 days was also shorter in whites than in Negroes: 5.0 and 6.1 days, respectively. The significance of this racial difference in reported duration of the shorter cases has a probability of less than 0.01 by the *t* test for unpaired data. The essence of the difference in both sets of data seems to lie in the much larger number of white cases said to have lasted 1 or 2 days (table 5). The basis of the difference between races need not be physiological: it may be sociologic, for example: (a) the degree of illness which each group accepts as a case of sore eyes, (b) the medical treatment given to cases by the two groups, (c) personal hygiene, or (d) some aspect of reporting, such as a tendency of white mothers to minimize the length of time their children remain ill.

Table 3. Numbers of persons having indicated number of cases of conjunctivitis per individual, by age and race

| Age (years) | Number of cases | | | | | | | | | |
|-------------|-----------------|----|----|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | 4 | | 5 | |
| | W | N | W | N | W | N | W | N | W | N |
| Total | 32 | 36 | 13 | 4 | 4 | 0 | 0 | 1 | 1 | 0 |
| Less than 1 | 3 | 4 | | | | | | | | |
| 1 | 5 | 6 | 1 | 1 | | | | 1 | | |
| 2 | 1 | 6 | 2 | | 1 | | | | 1 | |
| 3 | 2 | 4 | 4 | 1 | 1 | | | | | |
| 4 | 3 | 1 | 2 | | 2 | | | | | |
| 5 | 2 | 2 | 1 | 2 | | | | | | |
| 6 | 3 | 1 | 2 | | | | | | | |
| 7 | 3 | | | | | | | | | |
| 8 | 2 | 1 | | | | | | | | |
| 9 | 1 | 1 | 1 | | | | | | | |
| 10–14 | 2 | 3 | | | | | | | | |
| Over 14 | 5 | 7 | | | | | | | | |

NOTE: W—White; N—Negro.

attack rates are expressed as the number of cases times 100 per person-periods of experience. (The word "experience," as used here, means the sum of the unit periods of time covered by the interviewing.)

In the 11 rounds of visiting, the study population of 486 persons might have contributed a maximum of 11 times 486, or 5,346, person-periods of experience; 4,062 person-periods, or 76 percent of this maximum, were actually obtained. Fifty-six percent of the total experience was supplemented by physical examination of the eyes, the total number of examinations being 2,275. The number of eye examinations was disproportionately small for the males over 14 years old; and at the opening of the schools in September, there was a very marked drop in the number of eye examinations in the children of ages 5-14 inclusive. With these exceptions, the sampling of the study population was not unbalanced. No denominators have been adjusted to exclude either persons with chronic conjunctivitis or persons who might have acquired immunity to the disease.

Age, Race, and Sex

Preliminary analyses of the data showed no marked difference in conjunctivitis attack rates between male and female persons of all ages or

between white and Negro persons of all ages. It was apparent from the start, however, that the rates were much higher in children. In fact, only 17 of all the 123 cases occurred in the persons over 9 years old who made up 70 percent of the study population.

With respect to age, the rates for white and Negro children are found to differ markedly, yet rates for both races decrease rapidly after an early peak (table 1). In the white group, the highest attack rate occurs in two separate years (ages 2 and 3). In the Negro group, the highest attack rate occurs at age 1.

When the attack rates for white and Negro children are compared by age groups, the rate for children 1-4 years of age is found to be distinctly higher in the white population than in the Negro population (table 2). When the rates for both sexes are compared without separation as to race, the attack rates for males are higher, but only slightly so, for less than 1, 1-4, and 5-9 years.

Of course the attack rates, based on numbers of cases, are strongly influenced by the informant's definition of a case. Different individuals might count as one case, or as two cases, a single infection which had two separate periods when the signs and symptoms were more severe. In the present study as many as five cases have been reported in one individual (table 3).

Table 1. Conjunctivitis case attack rates in southwest Georgia, by age and race, May 17-October 29, 1951

| Age (years) | White | | | | Negro | | | |
|-------------|---------|-------|-------------------------|-------------------|---------|-------|-------------------------|-------------------|
| | Persons | Cases | Experience ¹ | Rate ² | Persons | Cases | Experience ¹ | Rate ² |
| Less than 1 | 7 | 3 | 62 | 4.8 | 13 | 4 | 71 | 5.6 |
| 1 | 9 | 7 | 90 | 7.8 | 11 | 12 | 88 | 13.6 |
| 2 | 7 | 13 | 60 | 21.7 | 9 | 6 | 82 | 7.3 |
| 3 | 7 | 13 | 60 | 21.7 | 12 | 6 | 94 | 6.4 |
| 4 | 8 | 13 | 74 | 17.6 | 9 | 1 | 74 | 1.4 |
| 5 | 7 | 4 | 73 | 5.5 | 7 | 6 | 65 | 9.2 |
| 6 | 6 | 7 | 50 | 14.0 | 6 | 1 | 53 | 1.9 |
| 7 | 5 | 3 | 46 | 6.5 | 2 | 0 | 17 | .0 |
| 8 | 5 | 2 | 48 | 4.2 | 5 | 1 | 42 | 2.4 |
| 9 | 3 | 3 | 29 | 10.3 | 6 | 1 | 53 | 1.9 |
| 10-14 | 18 | 2 | 167 | 1.2 | 16 | 3 | 137 | 2.2 |
| 15-19 | 12 | 0 | 102 | .0 | 13 | 0 | 114 | .0 |
| Over 19 | 182 | 5 | 1,647 | .3 | 101 | 7 | 664 | 1.0 |
| Total | 276 | 75 | 2,508 | 3.0 | 210 | 48 | 1,554 | 3.1 |

¹ Person-periods.

² Cases \times 100 per person-periods of experience.

attack rate, which is based on all children of the same age and race. By thus controlling the effect of age, the effect of family size can be evaluated separately. In the white families with 1, 2, or 3 children, the observed cases are somewhat fewer than those calculated from the rate for all families, and the ratio is reversed in families with more than 3 children. In the Negro families, the relative proportions of observed to expected cases are in just the opposite sequence, there being more cases in the smaller families than the data for the whole Negro group would lead one to expect. Statistically, there is no indication that the occurrence of sore eyes differs in families according to their size.

Another approach to the problem of intra-familial spread of conjunctivitis is to study the relative rate of transmission within family groups by computing secondary attack rates. For diseases in which one case confers lasting immunity, the denominator of a secondary attack rate is simply the total number of family members less the number of primary cases. Because a case of sore eyes may not confer immunity for even a single season (note the large number of multiple cases in table 3), the denominator must be corrected to include only the persons actually at risk. The situation is similar to that studied by Badger and associates in an investigation of respiratory illness in Cleveland, Ohio (5, 6). This group calculated secondary attack rates by studying selected units of family experience called episodes. An episode is defined as a period of 10 days which

Table 8. Number of episodes of conjunctivitis in southwest Georgia, grouped by numbers of index and secondary cases, May 17–October 29, 1957

| Number of index cases | Number of secondary cases | | | | Total episodes |
|-----------------------|---------------------------|---|---|---|----------------|
| | 0 | 1 | 2 | 3 | |
| 1..... | 63 | 6 | 1 | 2 | 72 |
| 2..... | 4 | 1 | 0 | 0 | 5 |
| 3..... | 2 | 0 | 0 | 0 | 2 |
| 4..... | 2 | 0 | 0 | 0 | 2 |
| Total episodes..... | 71 | 7 | 1 | 2 | 81 |

(a) follows a period of 10 days without reported illness of the type under study, (b) starts with the day of onset of the index case (or cases), and (c) continues for 9 more days. Index cases are defined as all cases with onset on the first day of an episode.

In applying these definitions to the data on sore eyes, 12 cases were excluded, 3 because they were recurrences of another case in the same episode. Of the remaining 111 cases, only 15 were secondary, and of the 96 index cases, 63 occurred with no other cases in the same episode (table 8). The small number of secondary cases precludes obtaining satisfactory secondary attack rates but does suggest that there is little spread within the family, at least after the first day of an episode. The fact that many families which had not had any previous or recent cases reported multiple cases with the same date of onset might

Table 7. Distribution of cases of conjunctivitis in southwest Georgia,¹ by number of children in family, May 17–October 29, 1951

| Number of children 0–14 years old | White ² | | | Negro ³ | | |
|-----------------------------------|--------------------|-----------------|----------|--------------------|-----------------|----------|
| | Number of families | Number of cases | | Number of families | Number of cases | |
| | | Observed | Expected | | Observed | Expected |
| 1..... | 17 | 8 | 12.96 | 5 | 3 | 1.60 |
| 2..... | 9 | 13 | 14.61 | 5 | 5 | 4.93 |
| 3..... | 5 | 16 | 18.75 | 11 | 18 | 15.47 |
| Over 3..... | 5 | 33 | 23.69 | 9 | 16 | 19.98 |

¹ Based on families with children under 15 years of age.

² The value of chi-square is 6.1 (d. f. 3, $P>0.1$).

³ The value of chi-square is 2.4 (d. f. 3, $P>0.4$).

Table 4. Average duration of cases of conjunctivitis by race, May 17–October 29, 1951¹

| Type of case | White | | Negro | |
|---|-----------------|-------------------------|-----------------|-------------------------|
| | Number of cases | Average duration (days) | Number of cases | Average duration (days) |
| All recovered cases----- | 33 | 2.6 | 13 | 4.9 |
| All active cases----- | 37 | 4.5 | 23 | 18.1 |
| Recovered cases of less than 14 days' duration----- | 32 | 2.3 | 12 | 4.1 |
| Active cases of less than 14 days' duration----- | 32 | 2.1 | 8 | 6.4 |

¹ Excluded are 7 cases which may or may not have been recovered on day of last pertinent interview and 11 cases for which total duration was not recorded.

Some light is shed on the question of reported duration of conjunctivitis by analyzing the records of treatment which were obtained in 1951. There are relatively more cases in the Negro population reported as having received no treatment (10 out of 48 cases) than in the white population (7 out of 74 cases). A greater difference, however, lies in the number of cases whose treatment included an antibiotic or the care of a physician (3 out of 48 in the Negro group, 30 out of 74 in the white group). Re-

Table 5. Duration of recovered cases of conjunctivitis in southwest Georgia, by race, 1949–50 and May 17–October 29, 1951

| Duration (days) | Number of cases | | | |
|-----------------|-----------------|-------|-------------------|-------|
| | 1949–50 | | 1951 ¹ | |
| | White | Negro | White | Negro |
| 1----- | 30 | 3 | 11 | 1 |
| 2----- | 92 | 35 | 12 | 1 |
| 3----- | 121 | 69 | 5 | 4 |
| 4----- | 66 | 43 | 0 | 1 |
| 5----- | 36 | 19 | 1 | 0 |
| 6----- | 22 | 16 | 0 | 3 |
| 7----- | 185 | 162 | 3 | 2 |
| 8–14----- | 145 | 180 | 1 | 0 |
| 15–21----- | 46 | 61 | 0 | 0 |
| 22–31----- | 34 | 22 | 0 | 0 |
| 32–120----- | 26 | 21 | 0 | 0 |
| Total----- | 803 | 631 | 33 | 12 |

¹ For cases for which approximate duration was given, whole days of duration were obtained by taking the first whole number above the mean.

gardless of the efficacy of any medicine used, the Negro population appears to have secured less treatment of an up-to-date nature.

Seasonal Occurrence

Grouped by month of onset, the cases of conjunctivitis in the white population show a small peak in June but are much more frequent in August, September, and October (table 6). The Negro cases have two peaks, one in June and one in October. The monthly attack rates

Table 6. Month of onset of conjunctivitis cases, by race, May 17–October 29, 1951

| Month | White | Negro |
|----------------|-------|-------|
| May----- | 3 | 7 |
| June----- | 10 | 12 |
| July----- | 8 | 5 |
| August----- | 18 | 6 |
| September----- | 15 | 7 |
| October----- | 21 | 11 |
| Total----- | 75 | 48 |

present the same picture, but here, as in the monthly totals, the numbers of cases are too small to justify any interferences.

Spread Within the Family

In spite of strong circumstantial evidence that the eye gnat is a vector of sore eyes, there is no reason to question the importance of transmission of conjunctivitis by contact, especially within the family. Opportunities for the direct transfer of infectious material from one person to another can be assumed to be more frequent between members of a family than between persons in the community as a whole, and, on the basis of this assumption, large families might be expected to have higher attack rates than small ones. For comparison with the number of observed cases of conjunctivitis in families with different numbers of children, the expected number of cases can be computed for children 0–14 years of age (table 7) by adding the number of expected cases for each child in each family. The number of expected cases for each child is the product of the person-periods of experience for each child times the age-specific

eyes than within this group. Palpebral hyperemia and crusts are therefore of dubious use in diagnosis. As a matter of fact, palpebral hyperemia was often difficult to recognize with assurance, and the presence of crusts may be in part related (inversely) to the availability of a water source and the frequency of washing the face.

The use of histories in the diagnosis of sore eyes seems to be justified on the basis of one very characteristic symptom, adherent lids, usually observable only when the individual awakes in the morning and therefore rarely seen by a person doing interviews. This symptom is mentioned in the history of 2 out of every 3 current cases; it is the symptom most frequently reported; it is recorded as a symptom more often than any sign; and finally, it is cited only once in the entire study in a person without reported sore eyes.

Discussion

To consider conservatively the results and possible implications of the present investigation, it is well to review its limitations. In line with the original purpose of investigating possible contacts between persons who had acquired cases of conjunctivitis, the study population was concentrated in one small area. It therefore cannot be considered a satisfactory sample of any larger group, and its comparatively small size is another disadvantage.

The lack of bacteriological culturing, which might seem an insuperable handicap, was unfortunate, but it did not seriously affect the study of illness as distinguished from infection. Actually, illness due to conjunctivitis cannot be measured by routine bacteriological culturing because infection with one or another species of *Haemophilus* (*aegyptius* or *influenzae*) has been found to persist in essentially asymptomatic persons for several months, according to unpublished observations of Dr. Dorland J. Davis.

Another limitation is a deficiency in the information on duration of illness, which resulted from failure to obtain the date of recovery for some cases. Another difficulty is the lack of basic data on immunity and the resulting problem of calculating satisfactory case attack rates.

Because the denominators cannot be corrected to exclude persons who were not at risk, the ratios do not represent an expression of the probability of infection and, accordingly, cannot be compared by means of the usual tests of significance.

In spite of all these drawbacks, several aspects of conjunctivitis observed in this study may well be characteristic of the disease over a much larger area. These findings are all concerned with differences between the white and Negro groups but are not dependent on the fact that the attack rates in the white group are higher than in the Negro group. First, the reported duration of acute cases is much shorter in the white group, and chronic cases (lasting 2 weeks or more) are much more common among the Negroes. Second, the records show that the white population took a more modern and more aggressive attitude toward the treatment of conjunctivitis. Third, in the white population there are more instances of multiple cases occurring in one individual. Fourth, the white age-specific attack rates decline more slowly with increase in age than do the Negro's.

These findings show that any attempt to measure the incidence of conjunctival disease should take into account the racial distribution of the population as well as its composition by age. They also indicate that much work needs to be done on the problem of susceptibility. Future studies of *Haemophilus* conjunctivitis should deal with the immunity conferred by previous cases, both treated and untreated, and should also explore the relation of overt illness to infection. With information on these aspects of the disease, it might be possible to show that, in areas where there are frequent opportunities for infection, the occurrence of new cases is closely related to losses in immunity.

Summary

An epidemiological study of conjunctivitis conducted in a rural town in southwest Georgia was based on interviewing and eye examinations without bacteriological culturing. Cases of conjunctivitis were less frequent and of longer duration in the Negro population than in the white population. There was no distinct

be the result of failure to recognize an initial case, but this is not necessarily so. Sore eyes will incubate in less than 24 hours, at least under artificial conditions (7); therefore, the spread from an original infection might be rapid enough to result in apparently simultaneous cases. Another possible explanation of the numerous cases occurring on the first day of an episode is that they might all be contracted from a source outside the family, perhaps even from eye gnats. If the infections are acquired through intrafamilial contact with an initial case, they are properly considered as secondary. If they are acquired, along with the initial case, from a source outside the family, they are indeed multiple index cases and their origin is a matter of real importance.

Diagnostic Symptoms

Whether or not a person was believed to have conjunctivitis, the record of the interview includes observations on all eye conditions of possible diagnostic value. These are reported as signs if observed during the physical examination, and as symptoms if included in the history. During the field work, bulbar hyperemia and purulent exudate were used to diagnose cases of sore eyes, and in consequence, these

conditions may have been reported more completely than the rest. In other respects as well, the information on signs and symptoms must be interpreted with caution. One reason is that "sore eyes" is so common a disease in southwest Georgia that many informants would take little notice of the exact signs or symptoms in a particular case. Another reason for careful handling of the data is that many cases were very mild. Though provision was made to grade both signs and symptoms in three degrees of intensity—mild, moderate, or severe—"moderate" was used only five times in the records, and "severe" not at all.

Despite the character of the data, it is possible to compare some of the signs and symptoms in persons reported as having conjunctivitis with those in persons not reported as ill (table 9). This comparison shows that two eye conditions, palpebral hyperemia and palpebral crusts, are not reliable in the diagnosis of conjunctivitis. Palpebral hyperemia was found as a sign 50 times in persons believed to have, or to have had, sore eyes and 78 times in persons believed not to have the disease. Palpebral crusts were seen 31 times in persons counted as having or having had sore eyes, and 41 times in persons counted as negative. No other sign, except colds and nasal conditions, was noted more times outside the group affected by sore

Table 9. Frequency of signs and symptoms of conjunctivitis in southwest Georgia, May 17–October 29, 1951

| Sign or symptom | Current cases 0–4 days old ¹ | | All current and recovered cases ² | | Persons not having conjunctivitis ³ | |
|----------------------------|---|-----------------------------|--|-----------------------------|--|-----------------------------|
| | Times physically observed | Times reported in histories | Times physically observed | Times reported in histories | Times physically observed | Times reported in histories |
| Bulbar hyperemia..... | 20 | 22 | 36 | 61 | 0 | 0 |
| Purulent exudate..... | 10 | 13 | 15 | 43 | 1 | 0 |
| Palpebral hyperemia..... | 12 | 3 | 50 | 7 | 78 | 1 |
| Palpebral crusts..... | 13 | 5 | 31 | 10 | 41 | 1 |
| Nasal symptoms; cold..... | 4 | 9 | 12 | 23 | 13 | 11 |
| Increased lacrimation..... | 1 | 4 | 1 | 9 | 0 | 0 |
| Adherent lids..... | 9 | 26 | 1 | 66 | 0 | 1 |
| Photophobia..... | 1 | 12 | 1 | 20 | 0 | 0 |
| Palpebral edema..... | 1 | 3 | 3 | 10 | 0 | 0 |

¹ 33 interview-examinations.

² 117 interview-examinations.

³ 2,036 interview-examinations of persons without reported conjunctivitis in 2-week period preceding interview.

NOTE: This table is based entirely on interviews which included physical examination of the eyes. It does not include 122 interview-examinations in which the type of hyperemia was not specified.

STATEMENT

*by the Food and Nutrition Board,
National Academy of Sciences-
National Research Council*

Cancer and Food Additives

IN the development of our knowledge of nutrition, primary emphasis has been given to deficiencies that may occur in our diets and to ways of safeguarding against them. Along with the application of such knowledge a notable reduction in dietary deficiency diseases has occurred. With decreasing need in the United States for emphasis in this direction, more effort has been devoted to the investigation of positive factors in foodstuffs that might be detrimental to health.

A group of conditions broadly termed "degenerative diseases" has assumed major importance as causes of illness and death in recent decades. The causes of these conditions are under intensive investigation, and especial emphasis is being placed on the role of environmental factors.

Causal relationships between environmental factors and human disease have long interested scientists. Indeed, knowledge of such relationships underlies most advances in preventive medicine. It is not surprising, therefore, that investigators at present are trying to determine whether factors in the environment are causally related to the occurrence of cancer in man. As has been true in the study of all diseases whose causes are unknown, the elements of the environment to which man is constantly or repeatedly exposed, for example, the atmosphere, water, and foodstuffs, command the greatest share of attention.

Legitimate Conjecture

Conjecture concerning possible cause and effect relationships is a common and sometimes an effective device in the development of new knowledge concerning disease. Many discussions concerning the possible relation of chem-

icals which may occur in foods to the occurrence of cancer in man have been held at scientific meetings, and reports of these have recently appeared in scientific publications. Scientists involved in discussions of food additives and cancer recognize the conjectures as such, and ascribe importance to them only insofar as they may stimulate the kind of inquiries which will help advance knowledge. When the scientific discussions, either written or spoken, have been reported through the press and other news media for public information, however, the conjectural nature of the scientists' discussions has frequently been forgotten, misconstrued, or poorly stated. This has contributed to the present apprehension among consumers over the safety of the food supply, and to the concern among food manufacturers over the possible loss of consumer confidence.

In view of these circumstances, it is desirable that a statement be made clarifying for the public the present state of knowledge about the relation between food additives and occurrence of cancer in man.

Known Facts

What is known concerning a definite relationship between ingestion of a substance and the subsequent development of cancer in man? Accidental repeated ingestion of radium paint or the use of so-called radium water has been followed by the development of cancer of the bone. The ingestion of certain aromatic amines, such as *b*-naphthylamine or 4-amino-diphenyl, through industrial exposure has been associated with the occurrence of cancer of the bladder. Epidemiological evidence indicates that a prolonged intake of sufficient arsenic may result in development of cancer of the skin.

difference in incidence with respect to sex, but the incidence by age group was highest in children 1-4 years of age, decreasing rapidly in the age groups 5-9 and 10-14 years. This decline, which was more rapid in the Negro group, is discussed in addition to other racial differences. A study of intrafamilial spread showed that multiple index cases are very frequent and secondary cases relatively scarce. Palpebral hyperemia and palpebral crusts were of little or no use in visual diagnosis, but adherent lids, reported as a symptom by informants, were strongly indicative of conjunctivitis.

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Departmental Announcements

John Alanson Perkins, Ph.D., was sworn in as Under Secretary of Health, Education, and Welfare on April 5, 1937, to succeed Dr. Herold C. Hunt. Dr. Perkins has been president of the University of Delaware since 1950.

He was president of the American Society of Public Administration in 1953 and since that date has been a member of the Executive Board of the United Nations Educational, Scientific, and Cultural Organization. He has also served as a member of the Social Science Research Council's Committee on Organization for Research. He served as secretary to the late Senator Arthur H. Vandenberg and has been a teacher of political science both at his alma mater, the University of Michigan, and at the University of Rochester.

Dr. Perkins became budget director of the State of Michigan in 1946 and in 1948 was appointed controller of the department of administration. He has served as a member of the State planning commission and of the Educational Policies Commission of Michigan.

Edward Foss Wilson, a Princeton graduate, was sworn in as Assistant Secretary of Health, Education, and Welfare (Federal-State relations) April 5. Former president and chairman of the board of Wilson & Co., Inc., Chicago, he has been active in civic affairs and in various voluntary organizations.

Mr. Wilson has been director of the Presbyterian-St. Luke's Hospital for the past 20 years and of the Illinois Division of the American Cancer Society for the past 9 years. He is a member of the Council on Medicine and Biology of the University of Chicago.

For his many services in the field of health and welfare, a citizen fellowship was conferred upon him by the Fellows of the Institute of Medicine in Chicago on December 4, 1956.

Katherine Brownell Oettinger has been appointed chief of the Children's Bureau to succeed Dr. Martha M. Elliot, who recently resigned to become professor of public health at the Harvard School of Public Health.

Prior to her previous post as dean of the Boston University School of Social Work, which she assumed in 1954, Dean Oettinger was a division chief in the bureau of mental health, Pennsylvania Department of Welfare. Before that she was engaged in psychiatric social work at a children's treatment center in Scranton, Pa., and in child guidance and family welfare work in New York City.

Dean Oettinger has been on the board of directors of the Massachusetts Association for Mental Health and on the Advisory Committees of the Child Guidance Foundation and the Massachusetts Society for Crippled Children. She is currently a member of a number of organizations concerned with social work.



Ethiopian Assignment

IN August 1954 the Ethiopian-American Public Health Joint Fund assumed responsibility for operating the Haile Selassie I Hospital in Gondar, Ethiopia. The fund's mission was the transformation of this institution of some 100 beds into a demonstration hospital and medical center where technical personnel would be trained. My main responsibility was to set up the laboratory. Primarily, it was to be used for training laboratory technicians, but it would also be available for use as a hospital service. My assignment also included teaching all the biological sciences and laboratory methods in the Public Health College and Training Center in Gondar.

I arrived in Gondar with my family on June 4, after 2 months at headquarters in Addis Ababa. Gondar is a town with a population of about 22,000 in northwestern Ethiopia. The great and pardonable curiosity of its populace was entirely reciprocated by my family. Because of our official status, a detail of rifle-carrying police was assigned to guard our house day and night, but at our request it was withdrawn.

Before the formal transfer of the hospital to the fund, we visited the grounds to become familiar with conditions and personnel.

Laboratory personnel consisted of 1 technician and 1 apprentice on detail for training from the nearby provincial army post. The

Dr. Arthur H. Webb writes an account of his assignment in Ethiopia from April 9, 1954, to April 28, 1956. His duties involved setting up a laboratory in Gondar and teaching biological sciences and laboratory methods in a college in that town. During his tour of duty Dr. Webb was on leave from the post of assistant professor of bacteriology at the Howard University Medical School, Washington, D. C., to which he returned after completion of his assignment.

laboratory equipment was a microscope, a table, some stains, and miscellaneous broken pieces of glassware. There was no laboratory budget; infrequent doles of alcohol were wheedled from the pharmacy, and Giemsa stain was purchased from time to time from personal funds of clinical staff members. Conferences with the laboratory technician, through an interpreter, revealed that he was performing a surprising range of simple laboratory procedures with practically no equipment, and that he was discouraged.

This technician, Ato Araya Guhley, had been presumably well trained at the Pasteur Institute in Addis Ababa, but owing to lack of working facilities his knowledge had deteriorated during the 8 years spent at the Gondar Hospital. He was at this time performing, more or less creditably, fecal examinations, blood counts, examinations for malarial parasites and relapsing fever, a simple urinalysis, and stains for tuberculosis, gonorrhea, and leprosy. He appeared to be sincerely interested in laboratory analysis and was enthusiastic about relearning things he had forgotten and in acquiring new skills.

Therefore, the first project was to stimulate Ato Araya with descriptions of projected development and to "sharpen" his performance. His response was satisfactory, and it was then possible to move on to a second phase of laboratory development.

Although the laboratory building was not completed, and the equipment not yet delivered, we decided to conduct a training experiment. A particularly alert youngster, a lad of 17 with 7 years schooling devoid of science instruction, was selected from a group of day laborers and put into the laboratory as a trainee. We wished to see if unusual pedagogical techniques were necessary.

The lad, Asfan Makonnen, turned out to be

Do these materials occur in the food supply of the United States? Arsenic is the only one. It may occur in some foods in extremely small concentrations as a pesticide residue and is normally present in certain foodstuffs which have received no pesticide treatment. Insofar as is known, there is no danger from the amount of arsenic likely to be consumed from these sources under ordinary conditions.

If this were all of the story, probably no public apprehension would have arisen.

Experimental Animal vs. Human Cancer

Investigators studying cancer have induced the development of tumors in experimental animals by purposely exposing them to a number and variety of chemicals. Such experimental cancer may be produced in animals by giving the agent by injection, by skin application, or orally. From this evidence and knowledge of how man may be like or different from the experimental animal in the metabolism, excretion, or storage of a particular chemical, the scientist can form a hypothesis as to how man might react to the ingestion of the chemical.

In this respect, the conservative position would demand that substances that produce cancer in experimental animals should be excluded from human foods as a precautionary measure, even though it is known that a substance carcinogenic in one species is not necessarily carcinogenic in others.

Knowledge about possible cancer-causing agents in foods is, in general, at the point that studies are being devised and undertaken to test such possible relationships. This research is, by its very nature, expensive and time consuming. Years of study will be required to build definitive knowledge concerning all causes of cancer. There is a need to continue and expand present efforts to identify any relationships which may exist between environmental factors and the occurrence of cancer in man. Measures taken to safeguard the food supply can be only as effective as our state of knowledge permits. Government agencies, the food industry, and bodies such as the National Research Council are working together to facilitate the development of this knowledge and its effective application as soon as the information becomes available.

Pearl McIver Retires From PHS

Pearl McIver, R.N., B.S., M.A., will retire from the Public Health Service in June 1957 to become the executive director of the American Journal of Nursing Company. At present she is chief of Public Health Nursing Services, Division of General Health Services.

A pioneer and recognized leader in her field, Miss McIver was the first public health nurse to enter the Public Health Service. After serving 10 years as director of public health nursing with the Missouri State Board of Health, she was appointed in 1933 as a public health nursing analyst in the Division of Scientific Research. In 1935 she became chief of the Service's Division of Public Health Nursing, a position she held for 22 years.

A special consultant to the World Health Organization for technical discussions on nursing at the 1956 World Health Assembly, Miss McIver was named during the same year

"Public Health Nurse of the Year" by the American Nurses Association. She was one of the recipients of the Lasker Group Award of 1955, and in 1951 received the Outstanding Achievement Award of the University of Minnesota.

Among the posts Miss McIver has held in a number of organizations were those of vice president of the American Public Health Association, president of the American Nurses Association, and chairman of the International Council of Nurses Committee on Constitution and Bylaws.

On Miss McIver's retirement, Margaret G. Arnstein, R.N., M.P.H., chief of the Division of Nursing Resources, will become chief of Public Health Nursing Services. Scheduled to assume the duties of Miss Arnstein is Apollonia O. Adams, M.A., now deputy chief of nursing resources.

a little English and were enthusiastic and faithful. Alemu, an amputee who had been dependent on the hospital social service department, was able to marry and establish his own home. Tashoma was like a proud housewife in his zeal to keep the building clean. Beyenne had learned to make bacteriological culture media and was now training as a laboratory technician. But the washroom had not always been so harmonious. The men had had no experience with laboratory glassware, and breakage was exuberant. Gradually, it came to be no more than one would expect in an operation of this size.

In October 1954 the teaching program of the health center started. Twenty-four young men of a broad variety of educational backgrounds were received. Some were proficient in English; some barely understood it. The course in biology cum physiology that I taught 4 hours a week for 15 weeks was about the hardest work I have ever done. Not only did I teach biology, I taught English as well, defining every word and writing it on the board.

Next were two trimesters of formal instruction and laboratory practice in the usual clinical diagnostic procedures, with emphasis on simple techniques considered most useful and reliable under field conditions.

When the second school year opened in October 1955, a second class of 34 health officer students and a first class of 20 community nurse students were admitted. The staff had decided to give the students short basic survey courses in biology, mathematics, physics, chemistry, and other sciences so that all students could be presumed to have had certain standard basic information.

I conducted a basic biology course of 16 lectures and demonstrations, designed as a background for understanding the functioning of the living organism. At the same time, second-year health officer students were assigned to the laboratory on rotation and, working under supervision of laboratory personnel, helped perform the laboratory routine.

During the second trimester of this school year, this laboratory practice was continued, and courses in microbiology were given to first-year male students and to community nurses.

The laboratory teaching of relatively inexperienced students is a process calculated to turn hair gray. The burden of individual instruction was partially solved by drafting three laboratory workers into the teaching laboratory as "graduate assistants." Seeing that students followed directions demanded constant vigilance.

Despite these difficulties, as well as chronic shortages of materials and lack of sufficient microscopes, instruction was given in microscopic fecal examination for parasites, hematology, the Kahn test for syphilis, and microscopic bacteriology. The second-year health officers made some small start in clinical chemistry as well.

There had always been at the Gondar hospital an informal training program for Imperial Army personnel. The army post commander, who is highly popular with the international personnel readily agreed to establish a laboratory to utilize the experience of soldier trainees, and a laboratory was set up with supplies and materials "loaned" from our stock on a returnable "if" and "when" basis. This installation served an army community of about 3,000 persons, did 10 to 15 tests a day, and sent us material for those procedures which it could not carry out. We continued to supply the installation.

Early in 1956 we were approached by the director of medical training, Ethiopian Ministry of Public Health, who asked us to share a training program with the Pasteur Institute of Addis Ababa. The arrangement provided for 6 months of didactic instruction at Pasteur Institute and then for 6 months of practical training in our laboratories.

In 1956 the laboratory employed 10 persons and had 5 army and Pasteur Institute trainees. For the first 25 days of that month, we registered 953 people for whom we performed 980 tests.

A fairly trustworthy service in hematology was offered, and our urinalysis and fecal examinations were good. We did only the Kahn test for syphilis, but the serologist was enthusiastic and ready to learn other tests. His performance could be depended upon. Bacteriology and chemistry were slow in development, I suspect because they require more judgment

an unusually fortunate selection. After a mere 20 months in the laboratory, he carried most inventory details in his head, prepared solutions and reagents, performed all the technical operations, and helped train new personnel. He organized projects and prepared data for reports; it was only necessary to explain carefully what was wanted, answer a few questions, and then leave it to Asfau. This was a prime example of an individual who needed only a chance. There is no reason to assume that he is remarkably different from other bright boys; he merely points up the unexplored and undeveloped potential of his fellows. Rapport was facilitated not only by his high degree of innate ability, but also by his unusual proficiency in the English language.

Real laboratory work began in December 1954 with delivery of the laboratory supplies and equipment. These were packed in 34 boxes on two huge trucks which came approximately 400 miles over rough, wornout mountain roads from the port of Massawa, Eritrea, to Gondar, at an altitude of 6,700 feet. The road rises to 12,000 feet at points. The crew assembled to unload the boxes had had apparently little experience with packages of that size and weight. They were willing workers, but the fact that one box exceeded one man's strength was something new; this is an area where the standard load is a donkey load or head load. With much confusion, shouting, and effort, boxes started to move. The scene remains vivid: 500-pound boxes of glassware dropped 6 feet from truck bed to hard-packed earth . . . 12 men maneuvering a 600-pound case to place it carefully on the back of one man . . . watching that one man literally sink into the earth beneath his load . . . trying to live through the conference that ensued before the box was finally lifted off the man . . . wondering whether lives would be lost . . . then, unpacking . . . the gay and vigorous hacking with axes and sledge-hammers at cases that contained precision instruments . . . one man inside a large box pitching out small packages.

Miraculously, out of approximately a quarter million separate pieces not a single item broke. Inventorying was smooth but slow because the new laboratory trainees, previously

selected and called to duty at this time, were unfamiliar with most items.

Two weeks after delivery of the equipment, training proceeded in earnest. Ato Araya, the senior technician, continued to be responsible for hospital work, while Asfau, the first trainee, assisted with new men. The first project was urinalysis; this was done on a somewhat mechanical basis without reference to theory. After about a month of this, when hands and eyes became familiar with colors and manipulations, the student health officers attending the Public Health College and Training Center entered laboratory training. Through the lectures for college students, the laboratory trainees learned the significance and theory of the manipulations they had already learned mechanically. Then too, with their new mechanical skills, they were able to give individual instruction to the professional students. Laboratory trainees and health officer students took the same examinations. As expected, trainees did better in practical work, and students excelled in theory.

In a relatively short time it was possible to build up a staff with fair proficiency in hematology, examination of feces, urinalysis, detection of blood parasites commonly found here, simple microscopic bacteriology, and syphilis serology.

The selection of personnel, ordinarily a major program, was simplified by the large number of applicants. Men chosen sometimes "on hunch" have on the whole worked remarkably well. Alazar was developing proficiency as a bacteriologist; Mammo's Kahn test was to be depended upon; and Mellise would some day be a competent hematologist. Gebre Sellassie and Asfau worked well in all fields. There were as yet no specialists; all had to serve where the work was heaviest. But each was allowed a measure of responsibility in one field; for example, all Kahn testing had to be done under Mammo's supervision.

While technical divisions of the laboratory were developing, the service branches were working, also. Since the trainees who spoke English were schoolboys without dependents, we staffed the washroom with mature men with families. These three were beginning to speak

Venereal Disease Contacts of Servicemen in Massachusetts, 1949-55

By NICHOLAS J. FIUMARA, M.D., M.P.H.

IN PREVIOUS publications I have outlined the philosophy and principles which guide the civilian venereal disease control officer in his relations with the military venereal disease problem (1-4). Briefly summarized, the civilian control officer is aware of the fact that the control of venereal diseases among military personnel is a joint function of military and civilian authorities. A military program aimed at the prevention and control of venereal diseases will be effective only to the degree of joint participation by the military and civilian partners. Each group must assume responsibility in certain areas, but the work of one must complement the efforts of the other. Failure of one partner to carry out his assigned tasks or failure to integrate military and civilian responsibility will result in weakening not only of the military venereal disease control program but the civilian program as well. It is my purpose to describe our experiences over the past 7 years in locating and examining venereal disease contacts who were named by infected military personnel and who could be found in Massachusetts.

Contact investigation begins long before civilian authorities receive contact reports. Actually, contact investigation in the armed

forces begins at the military installation with the infected serviceman who is being interviewed. It is the experience of venereal disease control officers that results of contact investigations vary, other factors being equal, with the adequacy or inadequacy of the interview (5, 6).

Once the interview is completed, the information obtained is transcribed on the prescribed epidemiological report form (PHS 1421-VD-REV. 3-53) and sent to the appropriate civilian health authorities. The essential contact information should be sent as speedily as possible. When feasible, telephone reports should be encouraged, and telegrams should be sent when out-of-state contact data are obtained. However, the prescribed report form must be completed and should be in the mail within 24 hours of the telephonic or telegraphic reports.

Who are the men in the armed services who contracted venereal disease during the last 7 years and named Massachusetts as "the place where their contact could most likely be found"? What is known about these men and their female sex partners? What were the results of our investigation? These data will be the subject of this report.

During 1949-55, 4,675 men in the armed services contracted venereal disease and named Massachusetts either as the place of encounter or exposure, or both. Of these men, 4,297 (91.9 percent) had gonorrhea, 269 (5.8 percent) had syphilis, and 109 (2.3 percent) had one of the minor venereal diseases. The number of infected military personnel reported in any one year fluctuated more or less according to the total strength of the armed forces during that year. Thus, with the increase in military

Dr. Fiumara is director of the division of venereal diseases, Massachusetts Department of Public Health, and lecturer in dermatology and syphilology at Tufts University School of Medicine and Boston University School of Medicine, Boston, Mass. This paper was presented at the First International Symposium on Venereal Diseases and the Treponematoses, Washington, D. C., May 31, 1956.

than the other procedures. Bacteriology was especially delayed because of the fluctuation in incubator temperature; nights were quite cool, and current was off entirely from about midnight to 9:30 a. m.

Therefore, although some of the projected services of the laboratory were not yet fully developed, some phases of the work were far enough along so that some crude figures could be analyzed. Some 4,000 stool examinations gave a positive figure of 74.4 percent. However, these were not general survey figures; they represent only persons who presented themselves for examination. Parasites found most often were *Ascaris* (30.2 percent), *Trichuris* (13.6 percent), and *Endamoeba histolytica* (34.8 percent).

A very low finding of 1.2 percent for ova of *Taenia saginata* is reported, although a high incidence of *Taenia* infection in humans was presumed. Beef is eaten raw on ceremonial and other occasions, and *Taenia saginata* is considered somewhat of a national pest. It is to be expected that beef animals are rather heavily

infected. Indeed, purgation in the hospital sometimes produced a yard or two of tapeworm, but *Taenia* eggs were rarely found in stool examinations conducted by fairly competent people. There is, however, a universal practice of taking periodically a local vermifuge, Kosso, which must move out the mature egg-producing sections of the worm, leaving the upper portions intact. There is also the possibility, since gravid proglottids detach themselves and actively pass the anal sphincter to expel their ova on the outside, that the feces were not the place to look for them. If Kosso is actually effective against the large flat tapeworm, it must have practically no effect on the large round *Ascaris lumbricoides*, which showed up in almost every positive stool.

These laboratories were staffed entirely by Ethiopian nationals. One may feel competent to predict that perhaps after some are sent away for further training Bagemder Province will have a clinical and public health laboratory that will compare favorably with any similar institution in that part of the world.

Abstracts of Soviet Medical Literature

The National Institutes of Health of the Public Health Service has completed arrangements with the Excerpta Medica Foundation of New York City for the translation and publication of abstracts representing Soviet contributions to medical research. The plan calls for broad coverage of the Soviet medical sciences. The collected papers of the institutes located in various cities throughout the U.S.S.R. as well as the professional journal literature will be covered.

Soviet specialists will contribute abstracts to Excerpta Medica, Amsterdam. The abstracts will be edited by a permanent editorial committee of 30 Soviet scientists appointed by the Excerpta Medica Foundation in cooperation with the presidium of the Academy of Medical Sciences, U.S.S.R., and will be supplemented by verbatim translations of published abstracts of Soviet literature. The whole work will be under the editorial supervision of Excerpta Medica's own specialists. The resulting abstracts, published under the title of "Abstracts of Soviet Medicine," will appear throughout 1957 in two separate series: Part A, Basic Medical Sciences, and Part B, Clinical Medicine.

Figure 2. Race and marital status of military venereal disease patients, Massachusetts, 1951-55.

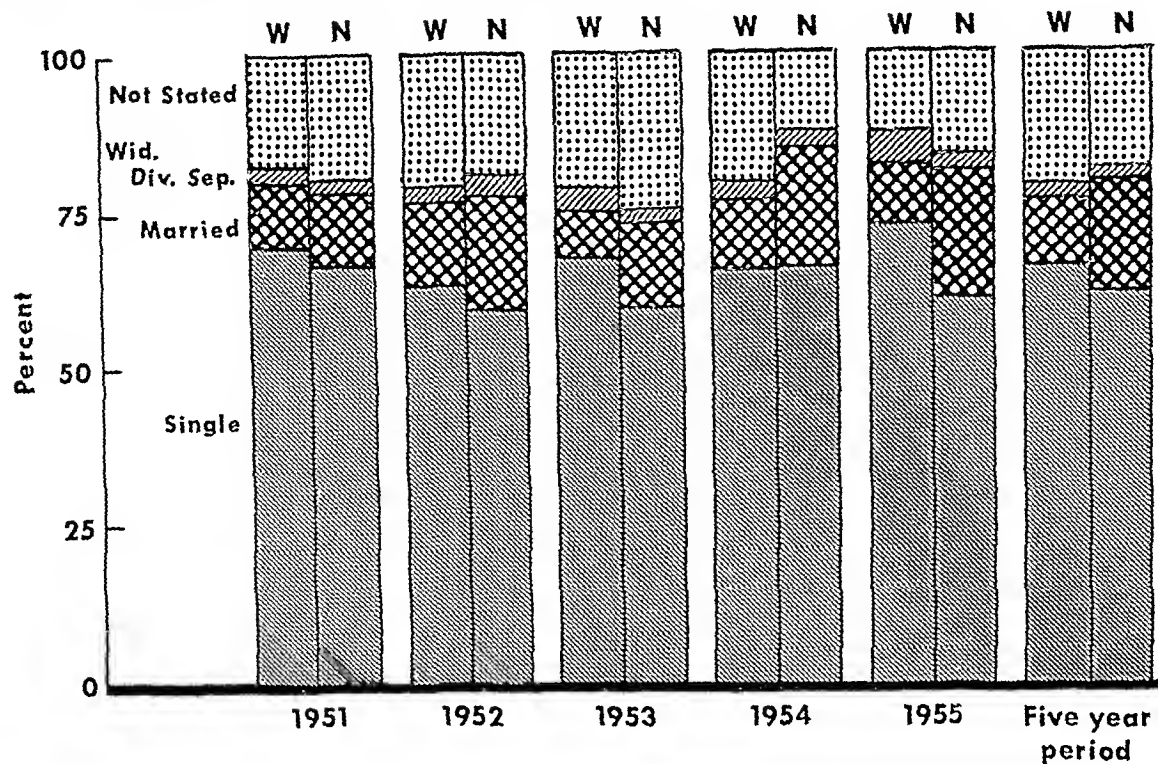


Table 1. Race and marital status of military venereal disease patients in Massachusetts, 1951-55

| Year | Total | Single | | Married | | Widowed, divorced, separated | | Not stated | |
|------------|--------|-------------|--------------|-------------|--------------|------------------------------------|--------------|-------------|--------------|
| | | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent |
| | White | | | | | | | | |
| 1951..... | 425 | 289 | 68. 0 | 43 | 10. 1 | 10 | 2. 4 | 83 | 19. 5 |
| 1952..... | 564 | 352 | 62. 4 | 74 | 13. 1 | 14 | 2. 5 | 124 | 22. 0 |
| 1953..... | 521 | 348 | 66. 8 | 42 | 8. 1 | 13 | 2. 5 | 118 | 22. 6 |
| 1954..... | 358 | 237 | 66. 2 | 37 | 10. 3 | 9 | 2. 5 | 75 | 21. 0 |
| 1955..... | 306 | 223 | 72. 9 | 31 | 10. 1 | 10 | 3. 3 | 42 | 13. 7 |
| Total..... | 2, 174 | 1, 449 | 66. 7 | 227 | 10. 4 | 56 | 2. 6 | 442 | 20. 3 |
| Negro | | | | | | | | | |
| 1951..... | 256 | 173 | 67. 6 | 31 | 12. 1 | 2 | 0. 8 | 50 | 19. 5 |
| 1952..... | 303 | 183 | 60. 4 | 57 | 18. 8 | 9 | 3. 0 | 54 | 17. 8 |
| 1953..... | 267 | 161 | 60. 3 | 39 | 14. 6 | 3 | 1. 1 | 64 | 24. 0 |
| 1954..... | 245 | 162 | 66. 1 | 48 | 19. 6 | 6 | 2. 4 | 29 | 11. 9 |
| 1955..... | 239 | 148 | 61. 9 | 50 | 20. 9 | 3 | 1. 3 | 38 | 15. 9 |
| Total..... | 1, 310 | 827 | 63. 1 | 225 | 17. 2 | 23 | 1. 8 | 235 | 17. 9 |

personnel in 1951 and 1952 during the Korean conflict, reported military cases increased (fig. 1). As the total military strength began to decrease in 1953 and the ensuing years, reported cases of venereal disease decreased. Military cases constituted about 20 percent of the total reported venereal disease morbidity in Massachusetts.

Data on marital and racial status of military venereal disease patients have been kept only since 1951. About 62 percent of the military personnel were white; 38 percent were Negro. About two-thirds of the men were single; about 13 percent were married (table 1). These same proportions held roughly for both whites and Negroes. The widowed, divorced, and sep-

arated contributed slightly more than 2 percent of the series. The marital status of 19 percent of the military patients was not recorded. There was no significant change from year to year in the proportion of single, married, and widowed, divorced, and separated men or of their racial status (fig. 2).

The average age of the military personnel infected with venereal disease over these 7 years was 23.3 years and the average age of their contacts, 24.3 years (table 2). The mean age of both military patients and their contacts has not changed during the past 7 years in spite of the expansion of the armed forces.

However, when military patients are analyzed by ages from 18 to 29 years, inclusive, an interesting trend is observed. In general, the

Figure 1. Reported cases of venereal disease among military personnel, Massachusetts, 1949-55.

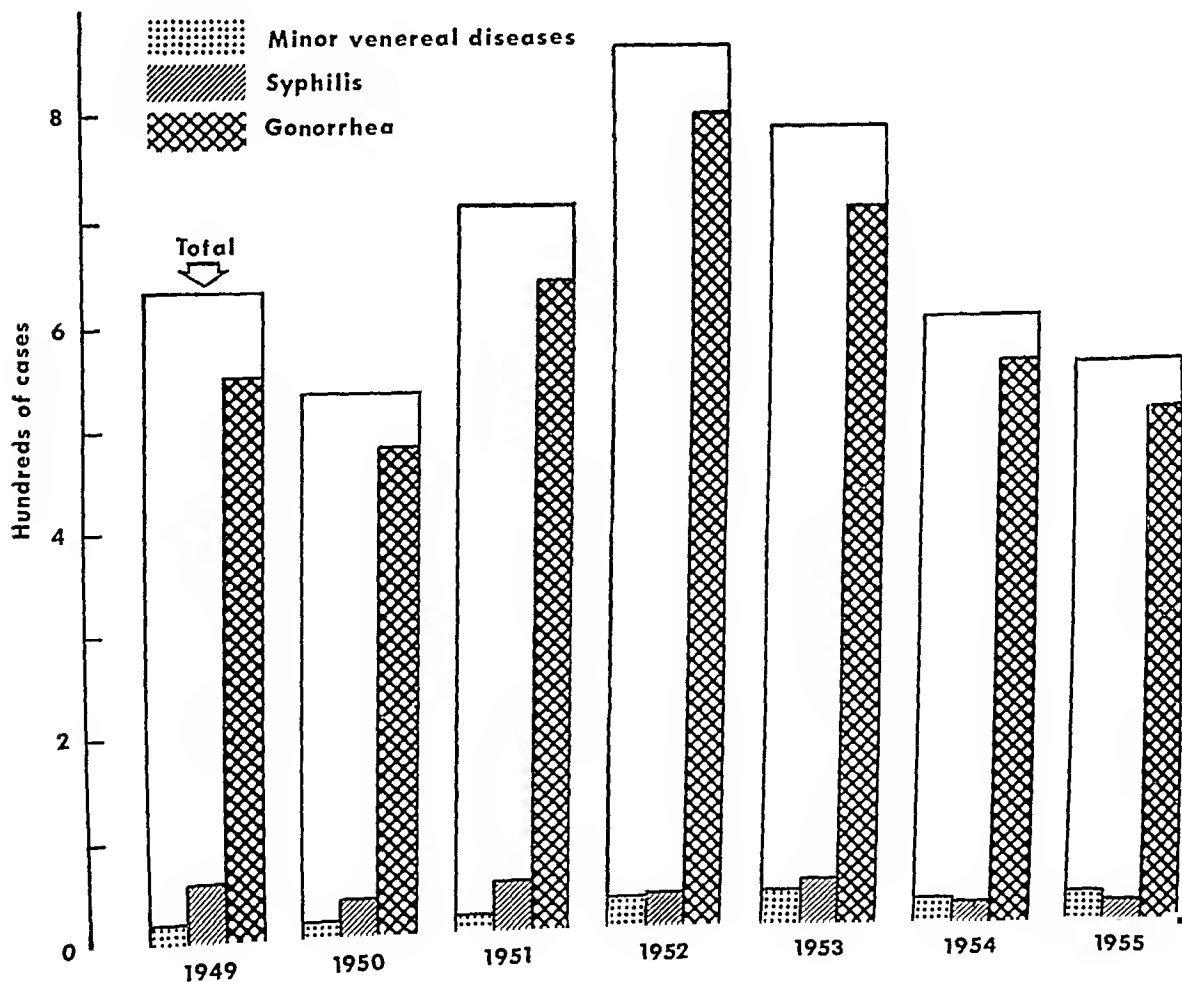


Table 3. Relationship of contacts to military venereal disease patients, Massachusetts, 1949-55

| Year | Total contacts | Relationship to patient | | | | | | | | | | | |
|-------|----------------|-------------------------|---------|--------|---------|------------|---------|-----------------|---------|------------|---------|------------|---------|
| | | Pickup | | Friend | | Prostitute | | Marital partner | | Homosexual | | Not stated | |
| | | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| 1949 | 677 | 515 | 76.1 | 120 | 17.8 | 28 | 4.1 | 8 | 1.2 | 1 | 0.1 | 5 | 0.7 |
| 1950 | 567 | 425 | 75.0 | 109 | 19.2 | 25 | 4.4 | 6 | 1.1 | --- | --- | 2 | .3 |
| 1951 | 781 | 551 | 70.6 | 144 | 18.4 | 60 | 7.7 | 16 | 2.0 | 1 | .1 | 9 | 1.2 |
| 1952 | 967 | 667 | 69.0 | 203 | 21.0 | 61 | 6.3 | 28 | 2.9 | 8 | .8 | --- | --- |
| 1953 | 906 | 655 | 72.3 | 168 | 18.5 | 58 | 6.4 | 24 | 2.7 | 1 | .1 | --- | --- |
| 1954 | 665 | 457 | 68.7 | 137 | 20.6 | 52 | 7.8 | 18 | 2.7 | 1 | .2 | --- | --- |
| 1955 | 585 | 421 | 72.0 | 100 | 17.1 | 47 | 8.0 | 15 | 2.6 | 2 | .3 | --- | --- |
| Total | 5,148 | 3,691 | 71.7 | 981 | 19.1 | 331 | 6.4 | 115 | 2.2 | 14 | .3 | 16 | .3 |

percent of the military patients stated that contacts were found through their own efforts. Pandering was mentioned in less than 1 percent of the cases, thus indicating indirectly the absence of active, widespread commercialized prostitution (table 4).

Where did the encounter and exposure take place? About 63 percent of the female contacts were said to have been met in a bar. Next in order of frequency was the contact's home which was mentioned by about 12 percent of the servicemen interviewed (table 5). Slightly more than one-third of the exposures for military patients took place in a home, about one-fourth in a hotel, and about one-fifth in an automobile (table 6).

What type of contact information did the interviewer obtain and what were the results of the investigation of these contacts? Complete information was available on 26.8 percent of the 5,148 contacts of military patients sent to us for investigation. With complete information, 85.9 percent of the contacts were found and examined, whereas with incomplete information only 47.6 percent of the contacts were located. Contact information is considered to be complete if there is furnished the contact's complete name and address, her first and last name and telephone number, her first name and telephone number, her complete name and place of employment, or her complete name without the address if it is accompanied with the name

Table 4. Procurement of contacts of military venereal disease patients in Massachusetts, 1949-55

| Year | Total contacts | Contact procured by— | | | | | | | | | | | | | | | |
|-------|----------------|----------------------|---------|--------|---------|-------------|---------|---------|---------|--------|---------|--------|---------|------------|---------|-----------------------------|---------|
| | | Serviceman | | Pimp | | Taxi driver | | Bellhop | | Friend | | Other | | Not stated | | Not applicable ¹ | |
| | | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| 1949 | 677 | 646 | 95.4 | 3 | 0.4 | 4 | 0.6 | 5 | 0.8 | --- | --- | 8 | 1.2 | 3 | 0.4 | 8 | 1.2 |
| 1950 | 567 | 544 | 95.9 | 4 | .7 | 1 | .2 | 2 | .3 | --- | --- | 10 | 1.8 | --- | --- | 6 | 1.1 |
| 1951 | 781 | 759 | 97.2 | --- | --- | 1 | .1 | 5 | .6 | --- | --- | 1 | .1 | 4 | .5 | 8 | 1.1 |
| 1952 | 967 | 927 | 95.9 | 1 | .1 | 6 | .6 | --- | --- | 3 | .4 | 3 | .3 | --- | --- | 23 | 2.4 |
| 1953 | 906 | 876 | 96.7 | 5 | .6 | --- | --- | 1 | .1 | --- | --- | --- | --- | --- | --- | 24 | 2.6 |
| 1954 | 665 | 639 | 96.1 | 7 | 1.1 | --- | --- | --- | --- | --- | --- | 1 | .1 | --- | --- | 18 | 2.7 |
| 1955 | 585 | 568 | 97.1 | 1 | .2 | --- | --- | --- | --- | --- | --- | 1 | .2 | --- | --- | 15 | 2.5 |
| Total | 5,148 | 4,959 | 96.3 | 21 | .4 | 12 | .2 | 13 | .3 | 10 | .2 | 24 | .5 | 7 | .1 | 102 | 2.0 |

¹ Wife named as contact.

military patients up to age 23 years dated older girls but at the age of 27 and older they dated younger girls. Thus, the serviceman in the age group 18-23 years named girls who were about one or more years older than himself. At ages 24-26 he would be apt to go out with girls of his own age, but when he reached the age of 27

Table 2. Average age of military patients with venereal disease and of their contacts, Massachusetts, 1949-55

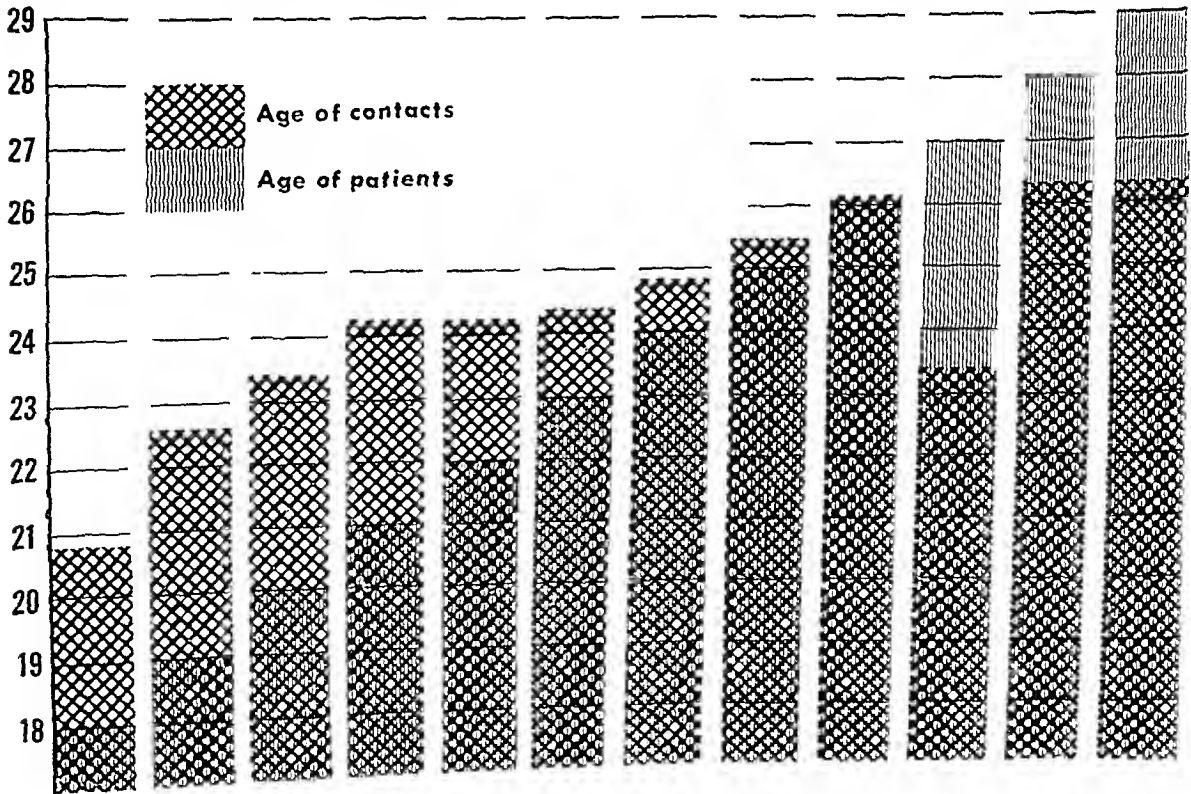
| Year | Patients | | Contacts | |
|--------------|----------|--------------------|----------|--------------------|
| | Age | Standard deviation | Age | Standard deviation |
| 1949..... | 23.4 | 3.9 | 24.3 | 4.7 |
| 1950..... | 23.3 | 4.0 | 24.7 | 5.4 |
| 1951..... | 23.4 | 3.4 | 24.5 | 4.5 |
| 1952..... | 23.6 | 4.2 | 24.1 | 5.0 |
| 1953..... | 22.9 | 3.8 | 23.8 | 4.4 |
| 1954..... | 23.0 | 2.9 | 24.7 | 5.5 |
| 1955..... | 23.1 | 3.8 | 24.3 | 4.7 |
| Average..... | 23.3 | 3.9 | 24.3 | 5.0 |

years or older, he would most likely date girls one or more years younger than himself (fig. 3).

During the past 7 years 5,148 girls were named as contacts of the 4,675 infected servicemen, a patient-contact ratio of 1 to 1.1. What was the relationship of the female contacts to the military patients? Most of the girls (71.7 percent) were reported to be pickups, and 19.1 percent were said to be "friends." This word is quoted because in most instances the serviceman did not know his friend's name. Therefore, it is our opinion that about two-thirds or more of these so-called friends could be classified as pickups. Prostitutes were named in 6.4 percent of the total series, and homosexuals were reported in 14 instances (0.3 percent). Thus, as can be seen in table 3, our problem in Massachusetts, as in most areas of the country, centers about the pickup rather than about the professional prostitute. The same types of individuals were reported each year in approximately the same proportion.

How did the serviceman meet the girl? How were the female contacts found? About 96

Figure 3. Age of military venereal disease patients and of their contacts, Massachusetts, 1949-55.



venereal disease patients, Massachusetts, 1946-55

| Contact encountered in— | | | | | | | | | | | | Year |
|-------------------------|----------|---------|----------|---------|----------|---------|----------|------------|----------|-----------------------------|----------|------------|
| Hotel | | Brothel | | Taxi | | Other | | Not stated | | Not applicable ¹ | | |
| Number | Per-cent | Number | Per-cent | Num-ber | Per-cent | Num-ber | Per-cent | Num-ber | Per-cent | Num-ber | Per-cent | |
| 34 | 5.0 | 2 | 0.3 | — | — | 19 | 2.8 | 11 | 1.6 | 8 | 1.2 | -----1949 |
| 22 | 3.9 | — | — | 1 | 0.2 | 7 | 1.2 | 7 | 1.2 | 6 | 1.1 | -----1950 |
| 24 | 3.1 | 3 | .4 | 1 | .1 | 19 | 2.4 | 73 | 9.3 | 13 | 1.7 | -----1951 |
| 11 | 1.1 | — | — | 3 | .3 | 18 | 1.9 | 55 | 5.7 | 26 | 2.7 | -----1952 |
| 5 | .6 | — | — | — | — | 19 | 2.1 | 42 | 4.6 | 23 | 2.5 | -----1953 |
| 3 | .4 | 3 | .4 | — | — | 15 | 2.3 | 27 | 4.1 | 18 | 2.7 | -----1954 |
| 3 | .5 | — | — | — | — | 15 | 2.6 | 41 | 7.0 | 15 | 2.6 | -----1955 |
| 102 | 2.0 | 8 | .1 | 5 | .1 | 112 | 2.2 | 256 | 5.0 | 109 | 2.1 | -----Total |

Table 7. Results of investigation of venereal disease contacts of military personnel located in Massachusetts, 1949-55

| Year | Number contacts investigated | Examined | | | | | | | | | |
|------------|------------------------------|----------|----------|----------|----------|-----------|----------------------|-----------------|--------------------|--------------|----------|
| | | Total | | Infected | | | | | | Not infected | |
| | | | | Total | | New cases | Treated on suspicion | Under treatment | Previously treated | | |
| | | Number | Per-cent | Number | Per-cent | Number | Number | Number | Number | Number | Per-cent |
| 1949..... | 677 | 369 | 54.5 | 305 | 45.1 | 93 | 149 | 60 | 3 | 64 | 9.4 |
| 1950..... | 567 | 303 | 53.4 | 265 | 46.7 | 76 | 130 | 59 | --- | 38 | 6.7 |
| 1951..... | 781 | 453 | 58.0 | 394 | 50.4 | 83 | 235 | 74 | 2 | 59 | 7.6 |
| 1952..... | 967 | 608 | 62.9 | 530 | 54.8 | 164 | 291 | 72 | 3 | 78 | 8.1 |
| 1953..... | 906 | 526 | 58.1 | 452 | 49.9 | 116 | 260 | 76 | --- | 74 | 8.2 |
| 1954..... | 665 | 392 | 58.9 | 338 | 50.8 | 112 | 178 | 3 | 45 | 54 | 8.1 |
| 1955..... | 585 | 336 | 57.4 | 290 | 49.6 | 101 | 152 | 33 | 4 | 46 | 7.9 |
| Total..... | 5,148 | 2,987 | 58.0 | 2,574 | 50.0 | 745 | 1,395 | 377 | 57 | 413 | 8.0 |

| Year | Not examined | | | | | | |
|------------|--------------|----------|---------------|---------------|--------------------------|----------|--------|
| | Total | | Uncooperative | Cannot locate | Insufficient information | No reply | Died |
| | Number | Per-cent | Number | Number | Number | Number | Number |
| 1949..... | 308 | 45.5 | 1 | 212 | 89 | 6 | --- |
| 1950..... | 264 | 46.6 | 1 | 192 | 67 | 4 | --- |
| 1951..... | 328 | 42.0 | 1 | 226 | 93 | 8 | --- |
| 1952..... | 359 | 37.1 | 1 | 281 | 67 | 9 | 1 |
| 1953..... | 380 | 41.9 | 2 | 289 | 80 | 9 | --- |
| 1954..... | 273 | 41.1 | 2 | 210 | 58 | 3 | --- |
| 1955..... | 249 | 42.6 | --- | 178 | 66 | 5 | --- |
| Total..... | 2,161 | 42.0 | 8 | 1,588 | 520 | 44 | 1 |

Table 5. Place of encounter between contacts and military

| Year | Total contacts | Contact encountered in— | | | | | | | | | | | |
|------------|----------------|-------------------------|----------|--------|----------|--------|----------|-----------|----------|---------------|----------|-----------------|----------|
| | | Bar | | Home | | Street | | Dancehall | | Beach or park | | Bus or railroad | |
| | | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| 1949..... | 677 | 450 | 66.5 | 68 | 10.1 | 53 | 7.8 | 6 | 0.9 | 15 | 2.2 | 11 | 1.6 |
| 1950..... | 567 | 378 | 66.7 | 49 | 8.7 | 72 | 12.7 | 11 | 1.9 | 7 | 1.2 | 7 | 1.2 |
| 1951..... | 781 | 466 | 59.7 | 92 | 11.8 | 56 | 7.2 | 12 | 1.5 | 16 | 2.0 | 6 | .8 |
| 1952..... | 967 | 624 | 64.5 | 145 | 15.0 | 47 | 4.9 | 18 | 1.9 | 15 | 1.5 | 5 | .5 |
| 1953..... | 906 | 590 | 65.1 | 110 | 12.2 | 81 | 8.9 | 11 | 1.2 | 18 | 2.0 | 7 | .8 |
| 1954..... | 665 | 404 | 60.8 | 97 | 14.6 | 84 | 12.6 | 6 | .9 | 4 | .6 | 4 | .6 |
| 1955..... | 585 | 347 | 59.3 | 76 | 13.0 | 57 | 9.7 | 13 | 2.2 | 11 | 1.9 | 7 | 1.2 |
| Total..... | 5,148 | 3,259 | 63.3 | 637 | 12.4 | 450 | 8.7 | 77 | 1.5 | 86 | 1.7 | 47 | .9 |

¹ Wife named as contact.

Table 6. Place of exposure of military venereal disease patients, Massachusetts, 1949-55

| Year | Total con- tacts | Place of exposure | | | | | | | | | | | |
|------------|------------------------|-------------------|--------------|--------------|--------------|-------------|--------------|------------------|--------------|------------------|--------------|---------------------|--------------|
| | | Contact's home | | Automobile | | Hotel | | Rooming house | | Beach or park | | Street | |
| | | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent |
| 1949----- | 677 | 244 | 36.0 | 65 | 9.6 | 270 | 39.9 | 10 | 1.5 | 27 | 4.0 | 9 | 1.3 |
| 1950----- | 567 | 190 | 33.5 | 93 | 16.4 | 200 | 35.3 | 24 | 4.2 | 21 | 3.7 | 5 | .9 |
| 1951----- | 781 | 267 | 34.2 | 152 | 19.5 | 209 | 26.8 | 29 | 3.7 | 18 | 2.3 | 6 | .8 |
| 1952----- | 967 | 363 | 37.5 | 189 | 19.6 | 259 | 26.8 | 29 | 3.0 | 19 | 2.0 | 13 | 1.3 |
| 1953----- | 906 | 368 | 40.6 | 189 | 20.9 | 216 | 23.8 | 38 | 4.2 | 19 | 2.1 | 9 | 1.0 |
| 1954----- | 665 | 313 | 47.1 | 142 | 21.3 | 123 | 18.5 | 31 | 4.7 | 6 | .9 | 3 | .5 |
| 1955----- | 585 | 250 | 42.7 | 153 | 26.2 | 107 | 18.3 | 19 | 3.3 | 19 | 3.3 | 2 | .3 |
| Total----- | 5,148 | 1,995 | 38.8 | 983 | 19.1 | 1,384 | 26.9 | 180 | 3.5 | 129 | 2.5 | 47 | .9 |
| | | Taxi | | Tourist camp | | Brothel | | Other | | Not stated | | Not appli- cable | |
| | | Number | Per- cent | Number | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent | Num- ber | Per- cent |
| 1949----- | | 7 | 1.0 | 9 | 1.3 | 2 | 0.3 | 12 | 1.8 | 14 | 2.1 | 8 | 1.2 |
| 1950----- | | 3 | .5 | 4 | .7 | 4 | .7 | 5 | .9 | 12 | 2.1 | 6 | 1.1 |
| 1951----- | | 5 | .6 | 8 | 1.0 | ----- | ----- | 5 | .6 | 72 | 9.2 | 10 | 1.3 |
| 1952----- | | 9 | .9 | 8 | .8 | ----- | ----- | 6 | .6 | 55 | 5.7 | 17 | 1.8 |
| 1953----- | | 7 | .8 | 7 | .8 | 1 | .1 | 2 | .2 | 28 | 3.1 | 22 | 2.4 |
| 1954----- | | 3 | .5 | 1 | .1 | 1 | .1 | ----- | ----- | 24 | 3.6 | 18 | 2.7 |
| 1955----- | | 2 | .3 | ----- | ----- | ----- | ----- | ----- | ----- | 18 | 3.1 | 15 | 2.5 |
| Total----- | | 36 | .7 | 37 | .7 | 8 | .1 | 30 | .6 | 223 | 4.3 | 96 | 1.9 |

military cases. The bars are the focal point for most pickups. The home, hotel, and automobile, in that descending order of frequency, are the most common places of exposure.

The results of investigation of contacts depend to a great extent on the type of information supplied by the interviewer. When contact information was adequate, more than 85 percent of the contacts were found and examined, but with incomplete contact data, only about 48 percent were located. The overall result for the past 7 years was that 58 percent of the contacts reported were found and examined. This experience emphasizes the need for concentrating on better and more satisfactory contact interviewing and for devising more efficient methods of venereal disease control.

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John F. Mahoney, 1889-1957



Dr. John F. Mahoney, who developed penicillin as a cure for syphilis, died February 23, 1957. At the time of his death, Dr. Mahoney was director of the bureau of laboratories of the New York City Health Department; he was health commissioner

of that city from 1949 to 1954.

Dr. Mahoney was a graduate of the Marquette University School of Medicine. He was commissioned as a medical officer in the Public Health Service in 1917, and in 1925, served as public health adviser to the U. S. Foreign Service. During this assignment in Haiti, Ireland, England, and Germany, he studied methods used in foreign clinics for the control of syphilis.

In 1929, he became director of the Venereal Disease Research Laboratory of the Public Health Service at Stapleton, N. Y., a position he held for 20 years. It was in this post that

he discovered that syphilis could be cured with penicillin.

Dr. Mahoney won the Lasker Award of the American Public Health Association in 1946. The accompanying citation read in part: "The general use of your discovery during World War II helped bring about among our armed forces notable reductions in amount of time lost from duty because of venereal disease; in the same period there was no increase in syphilis among the American civilian population."

Dr. Mahoney served as chairman of the Committee of Experts on the Venereal Diseases, World Health Organization, and chairman of the Committee for Standardization of Serologic Tests for Syphilis, American Public Health Association.

The author of more than 50 papers and articles in medical, scientific, and professional journals, he served as associate professor in clinical syphilology at New York University School of Medicine, and in dermatology at Columbia University School of Medicine.

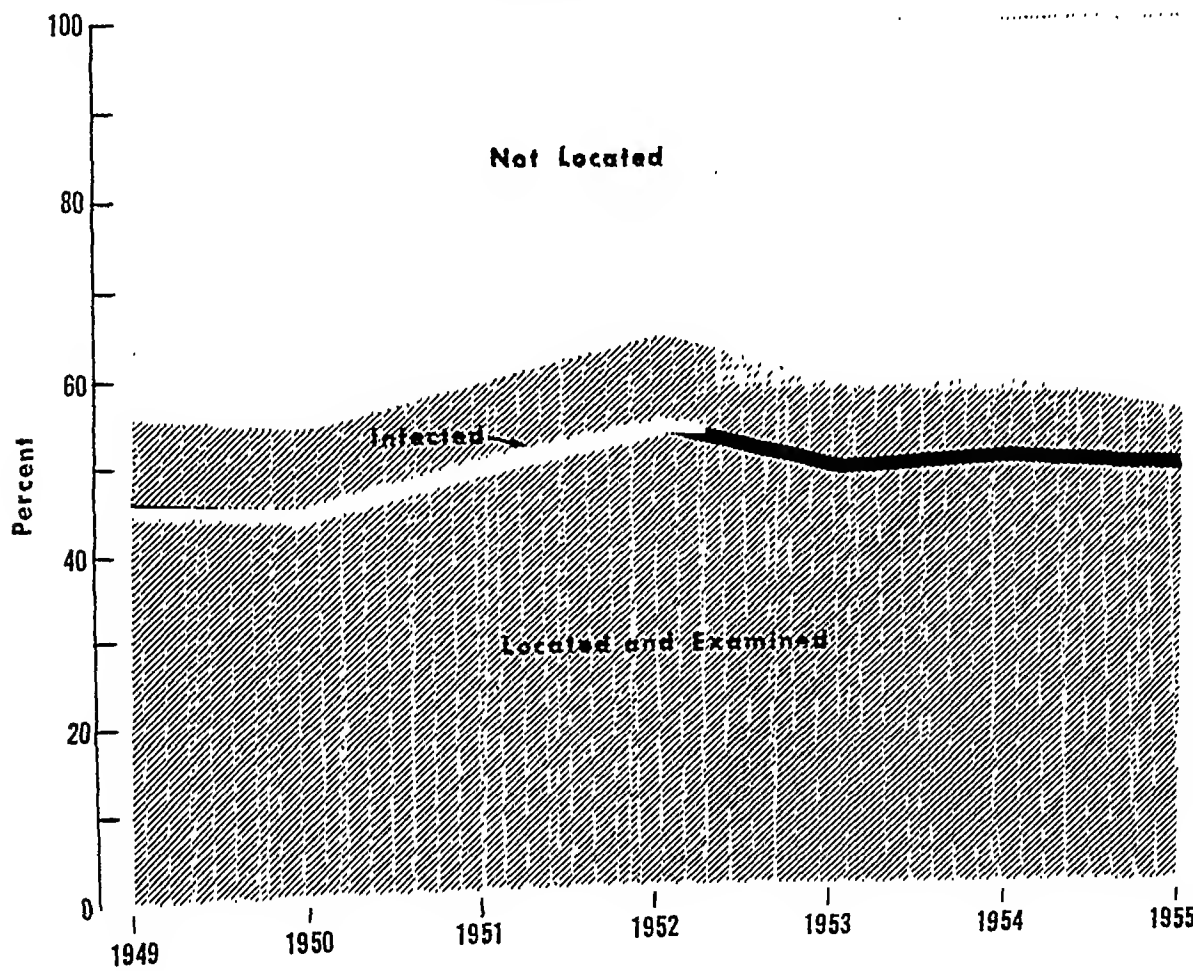
and address of a friend or associate. Information is classified as complete or incomplete on receipt of the contact data at our central office. In many instances, on investigation it is found that the data furnished by the patient are erroneous or false. In spite of this, however, for statistical purposes the information is still coded as complete. Thus, the staff was able to find about 58 percent of the named contacts of military patients (table 7, fig. 4).

Summary

Between 1949 and 1955 there were 4,675 armed forces personnel who contracted venereal disease and named Massachusetts as the place of encounter or exposure, or both. About

92 percent of the cases reported were gonorrhea. Approximately 62 percent of the military personnel were white and 38 percent were Negro. About two-thirds of the men were single, and 13 percent were married. These same proportions held roughly for both whites and Negroes. The widowed, divorced, and separated contributed slightly more than 2 percent of the series. In spite of an increase in the armed forces, the average age of the infected men and their contacts has not changed for the past 7 years. It was 23.3 years for the men and 24.3 years for the contacts. The venereal disease control problem in Massachusetts centers about the pickup: the prostitute was named in only 6.4 percent of the

Figure 4. Results of investigation of contacts of military venereal disease patients, Massachusetts, 1949-55.



and 1947. By 1949 and 1950 a small number of places, convinced of the benefits to be derived from fluoridation, instituted the measure as a regular practice. Late in 1950 published reports confirmed the anticipated reduced incidence of dental decay resulting from the addition of fluoride to drinking water, and national professional organizations endorsed the procedure. As a result, 109 communities in 1951 and 182 in 1952 decided to bring this health measure to their people, and the trend in reduction of tooth decay by an observed two-thirds was well under way.

As adoption of the procedure gathered momentum, the number of people drinking fluoridated water increased from about 1.6 million in 1950 to 5 million in 1951, 13.6 million in 1952, 17 million in 1953, 21 million in 1954, 24.8 million in 1955, and finally reached 31.4 million last year (fig. 1).

During the entire 12-year period, 80 communities, which at one time served fluoridated water to 1,900,000 people, discontinued the procedure. Of these, 10 communities, serving 223,000 people, reinstated the practice (table 2).

According to the 1950 Census of Population,

Table 1. Annual cumulative findings on the institution, discontinuance, and reinstitution of controlled fluoridation showing number of communities, water supply systems, and population served,¹ 1945-56

| Year | Fluoridation status at end of each year | | | Fluoridation instituted whether or not discontinued | | |
|-----------|---|--------------------------------|--------------|---|--------------------------------|--------------|
| | Number of communities | Number of water supply systems | Population | Number of communities | Number of water supply systems | Population |
| 1945..... | 6 | 3 | 231, 920 | 6 | 3 | 231, 920 |
| 1946..... | 12 | 8 | 332, 467 | 12 | 8 | 332, 467 |
| 1947..... | 16 | 11 | 458, 748 | 16 | 11 | 458, 748 |
| 1948..... | 24 | 13 | 581, 683 | 24 | 13 | 581, 683 |
| 1949..... | 46 | 29 | 1, 062, 779 | 46 | 29 | 1, 062, 779 |
| 1950..... | 95 | 62 | 1, 578, 578 | 96 | 63 | 1, 595, 128 |
| 1951..... | 329 | 171 | 4, 948, 259 | 331 | 173 | 4, 977, 709 |
| 1952..... | 709 | 353 | 13, 552, 501 | 716 | 360 | 13, 754, 623 |
| 1953..... | 949 | 482 | 17, 080, 930 | 961 | 494 | 17, 168, 202 |
| 1954..... | 1, 128 | 571 | 21, 208, 304 | 1, 160 | 601 | 22, 361, 517 |
| 1955..... | 1, 274 | 667 | 24, 775, 698 | 1, 332 | 713 | 26, 308, 979 |
| 1956..... | 1, 487 | 750 | 31, 416, 112 | 1, 557 | 813 | 33, 095, 570 |

| Year | Fluoridation discontinued whether or not reinstituted | | | Fluoridation reinstituted after discontinuance | | |
|-----------|---|--------------------------------|-------------|--|--------------------------------|------------|
| | Number of communities | Number of water supply systems | Population | Number of communities | Number of water supply systems | Population |
| 1945..... | | | | | | |
| 1946..... | | | | | | |
| 1947..... | | | | | | |
| 1948..... | | | | | | |
| 1949..... | | | | | | |
| 1950..... | 1 | 1 | 16, 550 | | | |
| 1951..... | 2 | 2 | 29, 450 | | | |
| 1952..... | 7 | 7 | 202, 122 | | | |
| 1953..... | 14 | 14 | 253, 738 | 2 | 2 | 166, 466 |
| 1954..... | 36 | 34 | 1, 323, 613 | 4 | 4 | 170, 400 |
| 1955..... | 64 | 52 | 1, 717, 653 | 6 | 6 | 184, 372 |
| 1956..... | 80 | 64 | 1, 902, 199 | 10 | 10 | 222, 741 |

¹ Most recently available population figures were used regardless of the year that fluoridation was instituted.

This second summary of the status of fluoridation includes the number of communities adding fluorides to their water supplies, the number of water supply systems, the population served, and the percentage of towns in each population category using this public health measure.

Status of Controlled Fluoridation in the United States, 1945-56

DURING 1956 fluoride was added for the first time to the drinking water of more than 6,500,000 people (table 1). This is nearly twice the number of people who started drinking fluoridated water in 1955. The 1956 increase was exceeded only in 1952 when 8,600,000 people started drinking fluoridated water.

In 1956, 213 communities started fluoridating their drinking water, a larger number than in each of the preceding 2 years. The number of water supply systems which these communities represent was slightly fewer than the number starting fluoridation in 1955 (92 compared with 96).

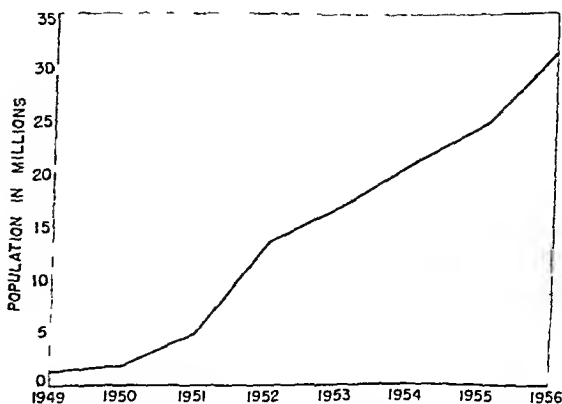
During the year, 12 water supply systems, representing 16 communities and serving a population of 185,000, discontinued fluoridation. Four water supply systems, representing an equal number of communities and serving 38,000 people, reinstituted the practice after discontinuance.

Although the annual rate of increase in the number of water supplies instituting fluoridation remained about the same during the last 3 years, there was a decline in the rate at which water supplies discontinued fluoridation. In 1954, 20 systems discontinued this public health measure. In 1956, 12 water systems stopped fluoridating. Two systems reinstituted fluoridation in 1954, four in 1956.

By the end of 1956 nearly 1,500 communities with 31,500,000 people fluoridated their water. It has been estimated that about 110,000,000 people in the United States are served by community water supply systems. At the present time about 1 in every 4 of these people are drinking water with adjusted fluoride content. It seems apparent that the number of people using water with a controlled fluoride content will continue to increase at a substantial rate.

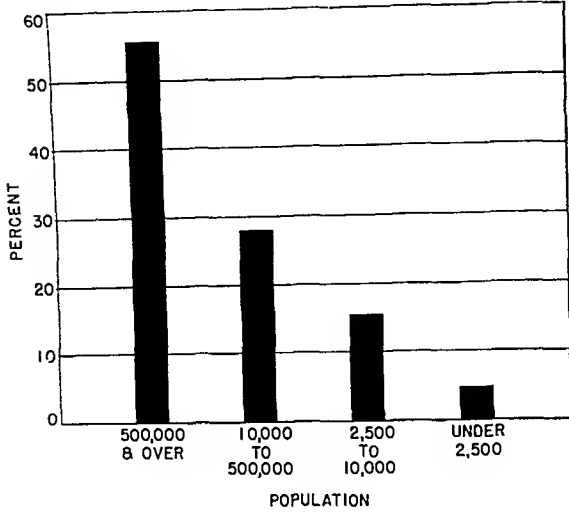
The year 1956 was the 12th year in which the practice of adding fluoride to the drinking water in optimal amounts has been practiced as a caries control measure. The procedure was started in a few study communities in 1945. More study communities were added in 1946

Figure 1. Population drinking water with adjusted fluoride content, 1949-56.



*Prepared by the Division of Dental Public Health,
Bureau of State Services, Public Health Service.*

Figure 2. Percentage of communities fluoridating their water supplies, by size, December 31, 1956.



using fluoridation increased from 12 to 15 percent, and the percentage of those under 2,500 increased from 4 to 5.

Water supplies in 85 percent of all communities fluoridating are operated under public ownership. The proportion is similar among large and small cities.

How the institution of fluoridation was authorized is a subject of considerable interest. In nearly 85 percent of the communities the governing body alone constituted the authority for

the action. In 5 percent, the authority was referendum; and in 4 percent of communities fluoridating, the utilities commission made the decision. It is interesting to note that in 91

Table 3. Total communities in the United States, by size group, compared with the proportion of each using controlled fluoridation, December 31, 1956

| Population of community | Number of communities in urban and rural territory ¹ | Communities using controlled fluoridation | |
|------------------------------------|---|---|---|
| | | Number | Percent of all communities of same size |
| Total..... | 18, 548 | 1, 487 | 8. 0 |
| 1,000,000 and over..... | 5 | 2 | 40. 0 |
| 500,000-999,999..... | 13 | 8 | 61. 5 |
| 250,000-499,999..... | 23 | 7 | 30. 4 |
| 100,000-249,999..... | 65 | 19 | 29. 2 |
| 50,000-99,999..... | 126 | 42 | 33. 3 |
| 25,000-49,999..... | 252 | 78 | 31. 0 |
| 10,000-24,999..... | 778 | 201 | 25. 8 |
| 5,000-9,999..... | 1, 176 | 209 | 17. 8 |
| 2,500-4,999..... | 1, 846 | 251 | 13. 6 |
| 1,000-2,499..... | 4, 296 | 277 | 6. 4 |
| Under 1,000 and not specified..... | 9, 968 | 393 | 3. 9 |

¹ SOURCE: Number of places in urban and rural territory, by size of place: 1950. Statistical abstract of the United States, Bureau of the Census, United States Department of Commerce, 1955, table 15, p. 23. Places under 2,500 in urban territory distributed in proportion to the distribution in rural territory.

Table 4. Ownership and authorization for fluoridation in places fluoridating, December 31, 1956, by size of community

| Population size of community | Number of communities | Ownership | | | Authorization | | | |
|------------------------------|-----------------------|-----------|---------|-------------------------|------------------------|--------------|------------------------|-------------------------|
| | | Public | Private | Other and not specified | Govern- ing body alone | Refer- endum | Utilities com- mission | Other and not specified |
| Total..... | 1, 487 | 1, 272 | 190 | 25 | 1, 252 | 77 | 56 | 102 |
| 1,000,000 and over..... | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 0 |
| 500,000-999,999..... | 8 | 8 | 0 | 0 | 7 | 1 | 0 | 0 |
| 250,000-499,999..... | 7 | 6 | 1 | 0 | 7 | 0 | 0 | 0 |
| 100,000-249,999..... | 19 | 17 | 2 | 0 | 17 | 0 | 0 | 2 |
| 50,000-99,999..... | 42 | 36 | 6 | 0 | 39 | 1 | 0 | 2 |
| 25,000-49,999..... | 78 | 70 | 7 | 1 | 70 | 2 | 2 | 4 |
| 10,000-24,999..... | 201 | 180 | 15 | 6 | 173 | 12 | 5 | 11 |
| 5,000-9,999..... | 209 | 177 | 30 | 2 | 180 | 10 | 1 | 18 |
| 2,500-4,999..... | 251 | 214 | 28 | 9 | 208 | 9 | 6 | 28 |
| 1,000-2,499..... | 277 | 235 | 35 | 7 | 233 | 9 | 10 | 25 |
| Under 1,000..... | 190 | 148 | 42 | 0 | 168 | 9 | 4 | 9 |
| Not specified..... | 203 | 179 | 24 | 0 | 148 | 24 | 28 | 3 |

Table 2. Annual incremental findings on the institution, discontinuance, and reinstitution of controlled fluoridation showing number of communities, water supply systems, and population served, 1945-56

| Year | Fluoridation instituted each year | | | Fluoridation instituted whether or not discontinued | | |
|------------|-----------------------------------|--------------------------------|--------------|---|--------------------------------|--------------|
| | Number of communities | Number of water supply systems | Population | Number of communities | Number of water supply systems | Population |
| Total..... | 1, 487 | 759 | 31, 416, 112 | 1, 557 | 813 | 33, 095, 570 |
| 1945..... | 6 | 3 | 231, 920 | 6 | 3 | 231, 920 |
| 1946..... | 6 | 5 | 100, 547 | 6 | 5 | 100, 547 |
| 1947..... | 4 | 3 | 126, 281 | 4 | 3 | 126, 281 |
| 1948..... | 8 | 2 | 122, 935 | 8 | 2 | 122, 935 |
| 1949..... | 22 | 16 | 481, 096 | 22 | 16 | 481, 096 |
| 1950..... | 49 | 33 | 515, 799 | 50 | 34 | 532, 349 |
| 1951..... | 234 | 109 | 3, 369, 681 | 235 | 110 | 3, 382, 581 |
| 1952..... | 380 | 182 | 8, 604, 242 | 385 | 187 | 8, 776, 914 |
| 1953..... | 240 | 129 | 3, 528, 429 | 245 | 134 | 3, 413, 579 |
| 1954..... | 179 | 89 | 4, 127, 374 | 199 | 107 | 5, 193, 315 |
| 1955..... | 146 | 96 | 3, 567, 394 | 172 | 112 | 3, 947, 462 |
| 1956..... | 213 | 92 | 6, 640, 414 | 225 | 100 | 6, 786, 591 |

| Year | Fluoridation discontinued whether or not reinstituted | | | Fluoridation reinstituted after discontinuance | | |
|------------|---|--------------------------------|-------------|--|--------------------------------|------------|
| | Number of communities | Number of water supply systems | Population | Number of communities | Number of water supply systems | Population |
| Total..... | 80 | 64 | 1, 902, 199 | 10 | 10 | 222, 741 |
| 1945..... | | | | | | |
| 1946..... | | | | | | |
| 1947..... | | | | | | |
| 1948..... | | | | | | |
| 1949..... | | | | | | |
| 1950..... | 1 | 1 | 16, 550 | | | |
| 1951..... | 1 | 1 | 12, 900 | | | |
| 1952..... | 5 | 5 | 172, 672 | | | |
| 1953..... | 7 | 7 | 51, 616 | 2 | 2 | 166, 466 |
| 1954..... | 22 | 20 | 1, 069, 875 | 2 | 2 | 3, 934 |
| 1955..... | 28 | 18 | 394, 040 | 2 | 2 | 13, 972 |
| 1956..... | 16 | 12 | 184, 546 | 4 | 4 | 38, 369 |

there were 18,548 communities in urban and rural territory in the United States. Table 3 presents a comparison of these communities, by size group, with the numbers of places using controlled fluoridation. Two of the five communities of over 1,000,000 population are now fluoridating their drinking water as are 8 of the 13 communities of 500,000 to 1,000,000 population. Thus, 55 percent of the largest cities in the country have adopted the measure. From 25 to 30 percent of places ranging in size from 10,000 to 500,000, and 15 percent of the

places from 2,500 to 10,000 population are now fluoridating. Of the 14,000 places of less than 2,500 population, only 5 percent are adding fluoride. Figure 2 shows the number of communities, by size, that have adopted the fluoridation procedure.

During 1956 the proportion of cities of 500,000 population and more that were fluoridating increased from 45 to 55 percent. Those with a population of from 10,000 to 500,000 people increased from 24 to 28 percent. The number of places from 2,500 to 10,000 in population

STATEMENT

*by the Food and Nutrition Board,
National Academy of Sciences-
National Research Council*

Supplementation of Dietary Proteins With Amino Acids

During the past few years the commercial production of a number of amino acids has progressed to the point where the cost is low enough to permit considering them for food fortification. Methionine is being added on an increasing scale to a greater variety of animal feeds. This practice has been shown to improve the feed with a consequent economic gain to the farmer.

Although there are a few reports on the benefits resulting from the supplementation of infant formulas with lysine (1), there is some question about the interpretation of the observation (2). Apart from the preceding consideration, there is a considerable amount of work with animals which indicates that the addition of an amino acid to a poor diet may sometimes aggravate the protein deficiency. These disturbances may result not only in poorer growth but also in the development of abnormalities such as fatty livers (3, 4).

The Food and Nutrition Board of the National Research Council at a recent meeting issued the following statement.

The possibility of correcting a dietary deficiency of an amino acid by supplementation with that acid is an attractive one. There are, however, several guiding principles which should be emphasized at this time.

Attention is called to the Statement of General Policy in Regard to the Addition of Specific Nutrients to Foods, issued by the Food and Nutrition Board in November 1953:

"With carefully defined limitations, the principle of the addition of specific nutrients to certain staple foods is endorsed for the purpose of maintaining good nutrition as well as for correcting deficiencies in the diets of the general population or of significant segments of the population. The requirements for endorsement of the addition of a particular nutrient to a particular food include (a) clear indications

of probable advantage from increased intake of the nutrient, (b) assurance that the food item concerned would be an effective vehicle of distribution for the nutrient to be added, and (c) evidence that such addition would not be prejudicial to the achievement of a diet good in other respects."

Some 25 amino acids are needed for the formation of the various cellular proteins of the body and for other special metabolic functions. Most of these acids can be synthesized by the body, if dietary protein intake is adequate. There are, however, at least eight which must be supplied daily by the protein in the diet in proportions and amounts to meet the requirements of metabolism. Any dietary protein which is relatively deficient in one or more of these essential amino acids has a reduced nutri-

percent of places of 25,000 and over in population, the procedure was authorized by the governing body. The smaller places resorted to referendum or utilities commission action with a little greater frequency—the largest percentage (6 percent) being observed in communities ranging from 10,000 to 25,000 in size. Table 4 shows findings on ownership and authorization.

Today, only 8 of the 18 cities in the country with over 500,000 population are not fluoridating. It is anticipated that most of these eight cities will institute fluoridation within the next

several years. After that occurs the rate of increase in the number of people drinking fluoridated water will depend largely upon the rate of adoption in cities of between 10,000 and 500,000. The lag in the smaller centers may also be overcome during the next several years because of the greatly reduced costs that are now possible, the present availability of simplified and accurate techniques for determining the fluoride content of water supplies, and the growing public acceptance of the measure throughout the country.

Employment After Forty

In a move to reduce enforced idleness, at the root of many difficulties besetting older people, New York State has raised to 38 the number of "older worker" counselors in the State Labor Department's employment service now serving in 15 cities.

These specialists were able in 1956 to find jobs for 4,100 of the 11,000 job seekers over 45 years old who had found their age an insuperable stumbling block in the hunt for work and accordingly had suffered loss of confidence. With the help of the counselors, they were accepted as teachers, purchasing agents, methods engineering consultants, organ makers, foremen, construction workers, bookkeepers, and for a wide variety of other positions.

Supplementing the work of these specialists, State employment offices in all localities emphasize placement of all older workers including those with special problems not related to age. A quarter of a million jobs, better than 1 out of every 4 filled by the employment service in 1956, went to persons over 45.

In part this indicates a generally tightening

labor market, but it also reflects efforts to persuade employers to abandon arbitrary age restrictions. In two cities, Newburgh and White Plains, the employment service found itself with more employer orders for mature workers than it could fill, until local newspapers helped encourage applications from older men and women who had thought that they would never find work again.

The professional office of the employment service in New York City, reporting 40 "older worker" placements in the first month after intensive efforts began, is one of the many offices to note changing and cooperative employer attitudes. Surprise has been expressed by employers at the variety and level of skill in the older group. This office reports that there is a new emphasis on qualifications rather than age and adds that these older workers have been placed in their own fields at their own level, an encouraging improvement over the stopgap type of job that they have been forced to take until recently.

—AVERELL HARRIMAN, *Governor of New York*,
in a legislative message, February 12, 1957.

The Migrant and

JUNE 1957

Published since 1878

OTIS L. ANDERSON

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frontispiece

All of us have a responsibility for helping the migrant farm worker and his family share in community services, including health services (see paper on pages 471-477).

tive efficiency. Emphasis is placed, therefore, upon the development of an adequate pattern of essential amino acids in the diet as well as upon the maintenance of an adequate protein intake. Although reasonable estimates can be made of the amino acid mixture which appears "ideal," the limits through which the pattern may vary and still be considered adequate are as yet unknown. Similarly, the definition of the amounts of protein of varying amino acid composition which are required for good nutrition under different physiological states requires further study.

There is reason for believing that nutritive requirements in disease may differ considerably from those in health. An amino acid pattern that is optimum for health and normal growth may require modification in pathological states in which the metabolism of one or another amino acid may be adversely affected. The study of amino acid metabolism in disease and the determination of desirable amino acid patterns in pathological states seem to be matters of great importance which may reveal particular needs for supplementation with specific amino acids or for the reduction of the intake of particular amino acids in the diet.

The imbalance of essential amino acids found

in some dietary proteins cannot always be corrected by adding a single amino acid, the imbalance being the result of a deviation in several of the essential amino acids from an "ideal pattern" needed by the body. Multiple supplementation is generally required. This type of supplementation is at present best achieved by mixed diets where one food protein supplements another. The benefits to be derived from amino acid supplementation are uncertain until our knowledge of the consequences of the amino acid imbalance is more complete. The Food and Nutrition Board recognizes the potential value of proper supplementation with amino acids and the desirability of intensive study of this problem.

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Education Projects for Retarded Children

Two cooperative research projects on the education of mentally retarded children were approved by the Office of Education, Department of Health, Education, and Welfare, in April 1957.

One of the projects, to be directed by Dr. Frances Mullen, assistant superintendent of schools of Chicago, will deal with the educational problems of mentally retarded children in special and regular classroom conditions. The Illinois State Department of Public Instruction and the city of Chicago will both participate.

The other project, with California participating, will be concerned with the effects of special training classes for severely retarded children. Dr. Leo Cain, dean of education services of San Francisco State College, will direct the project.

Sixty-six projects have been approved for cooperative educational research since September 1956. Thirty-nine of these concern education of the mentally retarded.

The Migrant and the Rest of Us

OTIS L. ANDERSON, M.D.

PUBLIC HEALTH workers, private physicians, and other local community residents are likely to have varied impressions of migrants depending on the angle from which they are viewed. The sanitarian sees the crowded housing of migrants with its lack of proper provision for sewage and garbage disposal and its water supply that may be polluted. The public health nurse who visits labor camps as part of her routine at the peak of the crop season sees cases of diarrhea, impetigo, malnutrition, and ear infections. The local physician and the hospital administrator see only people who come in an emergency when a serious accident or illness makes them seek medical care. Migrants may have few resources of their own for meeting an emergency. Nonresidence makes them ineligible for local welfare aid, and so some of their bills remain unpaid at the end of every crop season. The average person in a community is likely to view the migrant worker as a necessary part of the local economy, but potentially an economic burden if he stays beyond the season when he is needed. This same average person may fear the migrant as a potential disease carrier.

Only by putting all these views together can the migrant health problem be seen in its totality. For the Nation, the exact dimensions

of the problem are poorly defined. Twenty years ago a national health survey showed more frequent illness and longer-term disability among individuals and families on the move than among permanent residents. There is little evidence that the relative health status of the two groups has changed greatly in the last 20 years. Diarrheal disease continues to be common among migrant children. Outbreaks of typhoid and diphtheria continue to occur sporadically in migrant camps. All indications are that migrant children are probably less likely to be immunized against preventable diseases than resident children. Too often mothers fail to obtain prenatal care that will help to assure the health of both mother and child. Poor diets are common.

Number of People Involved

The national estimate of the number of migrants is approximately 1.25 million. Of these, nearly one-half million are foreign workers, chiefly from Mexico. These aliens are single men working under contract, with guarantees of work for stipulated periods of time. They are physically screened before they enter the country. Health insurance protection is given them under the terms of their contract. Housing for them must meet minimum requirements before they are assigned to an employer. When their contracts are fulfilled, the workers return to their own countries.

The tightening of our border patrol has nearly eliminated the wetbacks, illegal entrants, who formerly crossed the Mexican border in droves at harvest time.

Dr. Anderson, Assistant Surgeon General of the Public Health Service, is chief of the Bureau of State Services. This paper is based on an address at the Friday morning session of the Twelfth National Conference on Rural Health in Louisville, Ky., March 8, 1957. The conference was sponsored by the Council on Rural Health of the American Medical Association.

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in some dietary proteins cannot always be corrected by adding a single amino acid, the balance being the result of a deviation in several of the essential amino acids from an "ideal pattern" needed by the body. Multiple supplementation is generally required. This type of supplementation is at present best achieved on mixed diets where one food protein supplements another. The benefits to be derived from amino acid supplementation are uncertain until more knowledge of the consequences of the amino acid imbalance is more complete. The following are the members of the Committee on Amino Acid Imbalance:

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEROY E. BURNEY, *Surgeon General*

The Migrant and the Rest of Us

OTIS L. ANDERSON, M.D.

PUBLIC HEALTH workers, private physicians, and other local community residents are likely to have varied impressions of migrants depending on the angle from which they are viewed. The sanitarian sees the crowded housing of migrants with its lack of proper provision for sewage and garbage disposal and its water supply that may be polluted. The public health nurse who visits labor camps as part of her routine at the peak of the crop season sees cases of diarrhea, impetigo, malnutrition, and ear infections. The local physician and the hospital administrator see only people who come in an emergency when a serious accident or illness makes them seek medical care. Migrants may have few resources of their own for meeting an emergency. Nonresidence makes them ineligible for local welfare aid, and so some of their bills remain unpaid at the end of every crop season. The average person in a community is likely to view the migrant worker as a necessary part of the local economy, but potentially an economic burden if he stays beyond the season when he is needed. This same average person may fear the migrant as a potential disease carrier.

Only by putting all these views together can the migrant health problem be seen in its totality. For the Nation, the exact dimensions

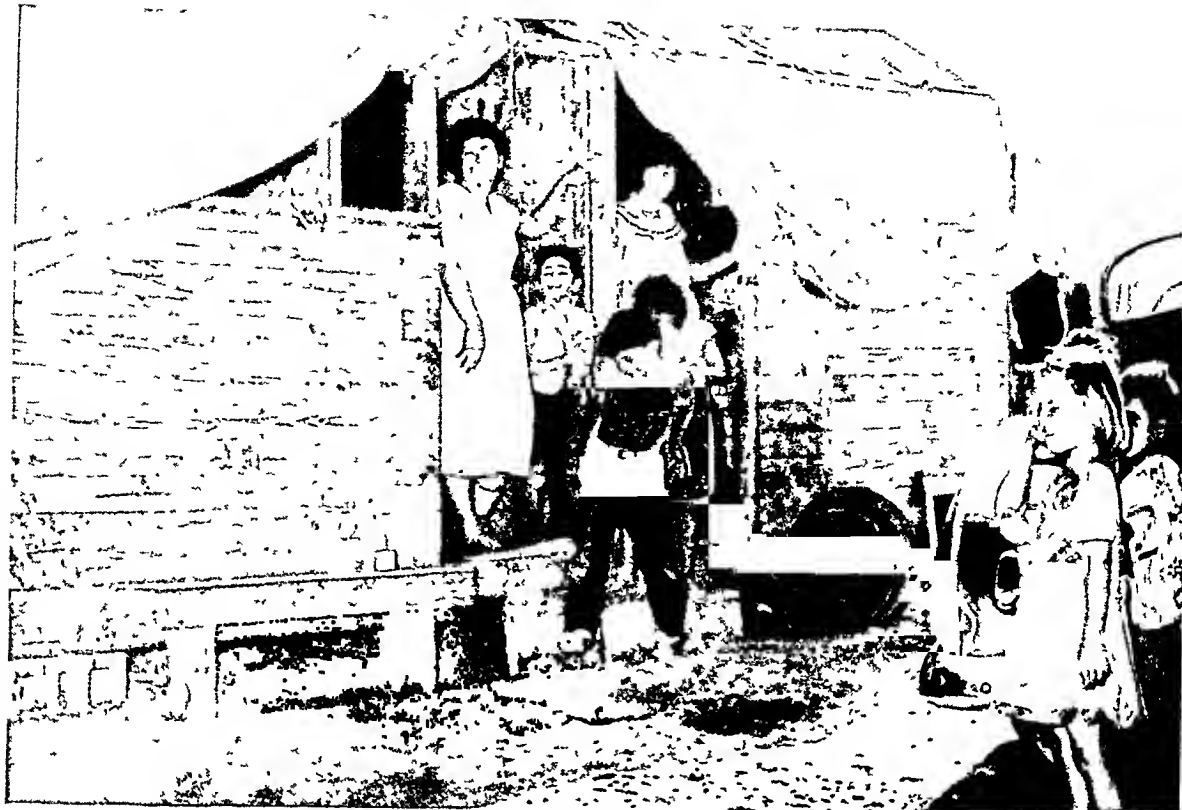
of the problem are poorly defined. Twenty years ago a national health survey showed more frequent illness and longer-term disability among individuals and families on the move than among permanent residents. There is little evidence that the relative health status of the two groups has changed greatly in the last 20 years. Diarrheal disease continues to be common among migrant children. Outbreaks of typhoid and diphtheria continue to occur sporadically in migrant camps. All indications are that migrant children are probably less likely to be immunized against preventable diseases than resident children. Too often mothers fail to obtain prenatal care that will help to assure the health of both mother and child. Poor diets are common.

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Many workers are accompanied by family dependents.

The remaining three-fourths of a million in the agricultural migrant population are workers and their dependents who come chiefly from the southern border States. Texas is the largest single supply State and the greatest demand State. Unlike the foreign workers with contracts, these domestic agricultural workers, who are United States citizens, seldom work under contract. Few have health insurance protection, and standards for their housing are likely to be minimal.

While the domestic migrant works in sugar beets, cherries, potatoes, cotton, or beans, his pay may be relatively good. But periods of employment are balanced by periods of unemployment when the weather is bad, crops are poor, or work not available between crop seasons. Working time is also lost when workers are traveling from job to job. Most domestic migrant families lead a hand-to-mouth existence with an annual income of not more than \$2,000 even when several members of the family work. The average cash income of the male migratory farm worker, according to a

1954 national sample survey, was \$1,160. This includes income from both farm and nonfarm sources.

Economic Background

Seasonal work in agriculture requires a mobile labor force. As American agriculture has become bigger and more industrialized, machines have reduced the total number of man-hours of work required to produce the Nation's food and fiber. But some operations have not yet been mechanized nor for them does mechanization appear to be possible. Thus, for the greater part of a year, a relatively small labor force may be able to carry on the work of many crop areas. For a few short weeks or months, however, this labor force must be greatly expanded or the rest of the year's work will be lost. Some local workers can be recruited for short periods, but in many areas, the local labor supply must be supplemented by outside workers.

Available work changes with the seasons.



Family "housing" in a makeshift camp.

In the early spring the vegetable pickers are stooping over the fields in Florida, the Lower Rio Grande Valley, and southern Arizona and California picking the fresh carrots, beans, spinach, peas, celery, and lettuce that we serve on our dinner tables. These workers are chiefly southern Negroes, Puerto Ricans, Indians of the southwest, Spanish-Americans, including both domestic workers and Mexican nationals, and Anglo-Saxons from low-income farming areas in the south.

By the middle of the summer some of these same people are doing the same kind of work in New York State, Michigan, Montana, Colorado, Idaho, Washington, Oregon, and other northern States. At the end of the crop season, they will head south again in trucks, buses, and cars.

Impact on Local Health Resources

As stated earlier, the total number of domestic migrants is estimated at about three quarters of a million. A map of their movement,

however, makes it clear that this figure is not a true measure of the size of the problem (1). It has been said that the number might well be multiplied by the number of times people move. In each new location housing must be available. Local health workers must be ready to provide services if the health of both migrant and resident population is to be protected. Other community services must be stretched to accommodate the strangers.

The number of migrants of greatest importance in planning health services is not the national total, but the number in a particular locality at a particular time. All but two States have at least a few migrants for at least a short time. In many States, however, the area requiring farm workers from outside is exceedingly restricted. Of the total of 3,068 counties in the Nation, about 800 are estimated to have as many as 100 or more domestic migrant workers and family dependents at the peak of the season. Only about 75 counties have more than 3,000. Twenty-two of these counties, however, have more than 10,000 migrants at



A health center operated by a voluntary group in a labor camp.

the peak. The peak period may last for only a few weeks or for several months.

The impact of migrants on a county varies according to the size of the resident population and the availability of health resources. A county with 100,000 people may be fairly well equipped to care for the health needs of its permanent residents. Stretching these services to meet the needs of a few thousand temporary residents may require special planning but may not interrupt the usual routine very drastically. If, on the other hand, 10,000 or more migrants flock into an area whose resident population is no more than a few thousand, the health problems confronting local physicians and public health workers may be doubled overnight. Migrant work areas are predominantly rural, and many have a shortage of local health resources even for permanent residents.

Federal vs. Local Responsibility

The interstate aspects of the problem become clear from a look at the main routes migrants

travel. On the east coast, about 50,000 migrants start in the south in the spring and move back in the fall. From south Texas, at least 100,000 fan out to other parts of Texas and to the North Central, Mountain, and Pacific Coast States. Another 80,000 or 90,000 move within California and to adjacent States

Because of this interstate movement, some people have looked at migrant health as an interstate problem, one that might properly come under the jurisdiction of the Federal Government. On this basis, the Federal Government undertook the organization and financing of the agricultural workers' health associations during World War II. Local physicians and public health agencies worked through these associations with the Federal Government in providing services in major work areas along each of the main migrant routes. The major part of the financing came from the Federal Government. Federal funds were discontinued after 1947.

Today, pressures continue to be brought upon the Federal Government for financing



Well-maintained family units in a large labor camp.

migrant health care on the basis that the migrants are nonresidents and, therefore, not the responsibility of the State or local area where they work and live temporarily. On the other hand, some people are beginning to look upon migrants as part of the permanent population of an area even though they live there for only part of the year.

Local Efforts to Assume Responsibility

The view that migrant farm workers and their families are a permanent and essential part of the local economy is leading some localities to try to provide for them accordingly. Generally, these localities find that providing better housing, encouraging migrant children to go to school, and arranging for health services pay off in terms of greater assurance of dependable workers when they are needed and reduce chances of disease arising and spreading among both migrants and local residents.

Partnership between local medical societies and public health workers has been arranged in

Fort Lupton, Colo., Fresno County, Calif., and a few other areas. Local physicians and public health nurses have teamed up in staffing clinics held during workers' off-hours. These clinics provide services to prevent and control the spread of communicable disease. They also provide medical care for people who need it. They have been set up in places and at times convenient for the workers, many of whom do not have their own transportation and cannot well afford to lose time from work to bring their children in for immunization or to get treatment for sickness or injury.

Arrangements such as these are born of a need mutually recognized by local physicians, local public health workers, and other local residents. These workers, assisted by volunteers, have community support behind them. But even under the best circumstances many problems arise. With the best of planning, a newly opened clinic may attract only a handful of patients at first. Some of the first patients may be more curious than in need of care. Considerable patience is required. Public health

nurses may need to visit migrant families and encourage them to come to the clinic before there is any great demand for service. Once understanding and acceptance of the service have developed, however, the demand may well test the endurance of the staff.

One Clinic's Operation

A look might be taken into a clinic that has operated for about 5 years in a large labor camp in a building provided by the employer. On a typical day the clinic starts in the early evening. There are only a few patients at first, but more and more come until the small building is jammed. Some people have had to arrange with others for transportation. Many bring small children. There are 60 patients, but at least twice as many people are waiting.

A volunteer from a local women's organization takes down essential information at the reception desk. In a small room at one side, a public health nurse advises mothers on the care of their small children. In another room a physician from the local medical society, assisted by two public health nurses, is examining and treating a steady flow of patients. The local welfare agency pays each of the six physicians who serve on a rotating basis a set fee for each clinic session he conducts.

The cases seen include a child with a lacerated foot, a suspected case of tuberculosis referred to the county hospital for X-ray, a case of venereal disease, a sprained arm, several pregnant women, and two members of a family referred to the clinic because another family member has recently been hospitalized for typhoid fever.

A class in home nursing is conducted by a Red Cross volunteer in a small back room. Here, and in the waiting room, people seem to welcome the chance for sociability.

By agreement among the local medical society and other local agencies, the small fee that is supposed to be charged each patient is often waived. This is especially true when opportunity for work has been scarce in recent months and the families living in migrant camps have little or no money. Under such circumstances, local people believe that asking even a small fee will discourage people from

coming for needed care and defeat the purpose of the clinic.

Variation in Local Projects

The situation varies widely from place to place. Local needs differ and local resources for meeting these needs likewise differ. The migrant population group itself varies from one place to another, and these variations require different approaches if needs are to be served. Differences in language present an obvious problem when the Spanish-speaking migrant comes to a local physician or to a public health clinic in northern Michigan or Wisconsin. Differences in health beliefs and practices may be equally baffling to the physician or nurse who is trying to explain to a migrant mother how to care for her children.

Often there will be a need for supplementing local health resources when the migrant influx is at a peak. Some communities have found inactive local nurses who are willing to help in a migrant project. Physicians from nearby towns have participated in clinics set up in or near migrant camps. The Home Missions Division of the National Council of Churches, the Catholic Charities, women's organizations, and other groups have provided volunteer assistance in clinics, transportation and interpretation to migrants, and interpretation to communities at large of what a clinic was trying to do. Also they have financed services for individuals, and provided direct financial support for clinic operation. Employers and their associations may furnish a building for a clinic, assist in financing, or lend support in other ways. Farmers' wives and their organizations are still another source of interest, support, and active participation on a voluntary basis.

Role of Federal Agencies

Although local projects necessarily vary according to the local situation, they are likely to have certain needs in common. For example, a need that is repeatedly voiced by local physicians and public health workers is for some method of assuring continuity in the services provided as people move from place to place. Questions of how to finance health services

through voluntary health insurance and other means also frequently arise.

Other problems that confront most communities when they become interested in trying to meet migrants' health problems include adapting health services to population groups that differ markedly from the resident population in personal characteristics and in living and working conditions; developing community understanding of migrant problems; and encouraging community support in meeting them.

The major role of the Public Health Service is one of consultation and technical assistance to State and local groups in meeting these problems. Both the Public Health Service and the Children's Bureau have assisted in planning experiments with health records to be carried by migrant families. Although we do not feel that the experiments thus far have provided definitive answers to the problem of providing continuity of health services as migrants move, we have learned much that can be applied in a future study of this problem.

Another role, chiefly informational, has been passing on to new areas the ideas and plans that other communities have found successful. The Public Health Service has served from time to time as a catalyst to bring together individuals and groups concerned with specific health problems associated with the migration of agricultural workers and their families.

The philosophy in terms of the long-run interests of both the domestic migrant and the community, including the Nation as a community, is that migrants need to be viewed as an integral part of the general population. They form an essential part of our human resources. Their problems arise to a considerable extent from a mobility that is required by our agricultural economy in its present stage of development.

Special services may be required at times to meet emergency conditions. Generally, however, it seems desirable to meet the needs of migrants through the framework of existing community services for other citizens, with such modifications as may be necessary to meet the migrant's peculiar working and living conditions.

"The Rest of Us"

Certainly the whole Nation profits by migrant labor. Much of the food that reaches our family tables is harvested and processed by migrant workers. The communities where migrants work and live temporarily profit most of all. Sometimes local people say, "We have no responsibility for migrants. They don't pay taxes." Some of these same people might find it difficult to pay their own taxes if migrants failed to appear at the critical times in crop production and harvesting.

All of us have a responsibility for understanding the important contribution the agricultural migrant makes to our economy. We have a further responsibility for helping him and members of his family share in community services on a continuing basis, including health services. The Public Health Service is sincerely interested in helping to identify the health problems both of the person who is on the move and of the communities to which he returns for a short time each year and to plan for meeting these problems.

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use of general hospitals

Factors in Outpatient Visits

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LESLIE MORGAN ABBE, B.S.

AS PART of a study of the use of general hospitals, the level of use of outpatient facilities in relation to various personal, geographic, and economic factors has been investigated. Data were obtained through interviews of about 27,000 households, including about 90,000 persons of all ages, drawn from the civilian, noninstitutional population of every State in the United States. Selected highlights of the findings on outpatient visits are reported here as advance information.

In the course of each interview, the respondent was asked whether anyone in the household had received care in any hospital without staying overnight, "for example, in a hospital clinic, emergency room, outpatient department, etc." For each person identified as having received outpatient care, the name and location of hospitals visited and the number of visits made for outpatient care during the previous 12 months were recorded. Personal characteristics of each member of the household and the income level of each household were also

learned. In tabulating results, particular attention was given to determining the place of care with respect to the type of place of residence (metropolitan, urban, or rural) of the patient.

The survey findings are limited by the exclusion of institutional populations, the absence of data on hospital use by persons who died, emigrated, or entered the armed services before the survey date, and the normal variability of sampling. In addition, note should be made of the possibility of errors in response with respect to the data on outpatient visits. The frequency of outpatient visits may not be remembered as completely as the frequency and extent of inpatient care. Earlier experience in health surveys indicates a considerable loss of recall when the period of time elapsed between the occurrence and the reporting is extensive, unless the event was important in itself to the person interviewed or was associated with significant points in time or other distinguishing factors (1, 2). In this survey differentials in use are more important than definitive levels of use. Accordingly, while under-reporting may affect the general level of use, it is considered of minor consequence.

Two basic measures have been selected to

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This paper is the second interim report setting forth provisional findings of a national household survey of the use of general hospitals. The first, published in the May 1957 issue of *Public Health Reports* (pp. 397-403), briefly described the survey procedure and presented findings on demographic and ecologic factors in the use of inpatient facilities. Analysis and interpretation of the data will be included in a summary monograph when the study is completed.

The survey is considered a first step in defining more precisely appropriate standards of need for general hospitals in the light of changing medical practice and changing patterns of care. It is expected to point the way to more intensive studies of the real need for physical facilities for adequate care of a known and described population. The survey was conducted for the Division of Hospital and Medical Facilities of the Public Health Service in September 1956 by the Bureau of the Census in connection with its monthly current population survey.

describe the level of outpatient visits in varying circumstances. These are the number of outpatients receiving care annually per 1,000 population and the number of outpatient visits annually per 1,000 population. The volume of outpatient care reflected by these measures is set forth in comparison with three types of factors. One group of factors, relating to personal characteristics, may be considered demographic factors. Another group relates to the nature of the geographic and social setting of the place of residence and the place of care. In this study, these are called ecologic factors. A third factor is family or individual income.

Demographic Factors

Sex and race have very little effect on the number of outpatients cared for, but they do affect greatly the number of outpatient visits (table 1).

Outpatient visits of white persons number 151 annually per 1,000 population, while visits of nonwhite persons amount to 238 per 1,000 population. For the nonwhite population,

similar contrasts appear between men and women; nonwhite males report 188 visits, while nonwhite females report 285 visits. In the white population, only small differentials appear between visits of men and women.

Age affects the number of outpatients only slightly, except that a higher rate is found for children, but total outpatient visits rise substantially with age (table 2).

For children under 14 years of age, the number of outpatients, 58 per 1,000 population, is well above that of other age groups and the average (47) for all ages.

The number of outpatient visits is highest for the age groups above 45 years. The maximum is 251 visits for the age group 55-64 years, as compared with 161 visits for all ages and 98 visits for adolescents and young adults (ages 14-24 years).

Table 1. Outpatient care in general hospitals, by sex and race

| Sex and race | Annual number of outpatients per 1,000 population | Annual outpatient visits per 1,000 population |
|-----------------|---|---|
| Both sexes..... | 47 | 161 |
| White..... | 47 | 151 |
| Nonwhite..... | 45 | 238 |
| Male..... | 47 | 151 |
| White..... | 48 | 146 |
| Nonwhite..... | 43 | 188 |
| Female..... | 47 | 170 |
| White..... | 47 | 156 |
| Nonwhite..... | 48 | 285 |

Table 2. Outpatient care in general hospitals, by age

| Age groups, in years | Annual number of outpatients per 1,000 population | Annual outpatient visits per 1,000 population |
|----------------------|---|---|
| All ages..... | 47 | 161 |
| Under 14..... | 58 | 136 |
| 14-24..... | 43 | 98 |
| 25-34..... | 42 | 169 |
| 35-44..... | 40 | 153 |
| 45-54..... | 43 | 204 |
| 55-64..... | 45 | 251 |
| 65 and over..... | 41 | 193 |

Veteran status has minor effect on the number of outpatients cared for, but considerable effect on total outpatient visits (table 3).

Veterans of World War II report 188 outpatient visits annually, as compared with 109 visits for other veterans and 141 visits for non-

Table 3. Outpatient care in general hospitals for males 14 years old and over, by veteran status

| Veteran status | Annual number of outpatients per 1,000 population | Annual outpatient visits per 1,000 population |
|--------------------------------------|---|---|
| All males 14 years old and over..... | 41 | 148 |
| Veterans..... | 38 | 161 |
| World War II veterans..... | 41 | 188 |
| Other veterans..... | 32 | 109 |
| Nonveterans..... | 43 | 141 |

Table 4. Outpatient care in general hospitals for persons 14 years old and over, by employment status and industry

| Employment status and industry | Annual number of outpatients per 1,000 population | Annual outpatient visits per 1,000 population |
|--|---|---|
| All persons 14 years old and over..... | 42 | 171 |
| In labor force..... | 39 | 126 |
| Employed..... | 39 | 123 |
| Agriculture..... | 32 | 83 |
| Nonagricultural industries..... | 39 | 128 |
| Wage and salary workers..... | 40 | 130 |
| Mining ¹ | 66 | 173 |
| Construction..... | 42 | 115 |
| Manufacturing..... | 39 | 125 |
| Transportation, etc..... | 33 | 116 |
| Trades..... | 38 | 109 |
| Services..... | 41 | 152 |
| Professional..... | 42 | 132 |
| Other services..... | 41 | 167 |
| Public administration..... | 50 | 157 |
| Self-employed workers..... | 34 | 108 |
| Unpaid family workers..... | 38 | 151 |
| Unemployed workers..... | 56 | 222 |
| Not in labor force..... | 47 | 235 |
| Keeping house..... | 47 | 231 |
| Going to school..... | 38 | 87 |
| Unable to work..... | 67 | 822 |
| Other nonworkers..... | 48 | 249 |

¹ Includes forestry and fisheries.

veterans, among all males 14 years old and over.

Employment status and industry are accompanied by substantial differences both in the number of outpatients and in total outpatient visits (table 4).

For all persons 14 years of age and over, the number of outpatients cared for annually is 42 per 1,000 population. Within the labor force the number ranges from 32 for those employed in agriculture to 66 for wage and salary workers in mining (including forestry and fisheries). A similar high rate of 67 patients per 1,000 population is reported for persons unable to work because of a long-term illness or disability.

Total outpatient visits vary even more widely. The average rate for all persons employed is 123 visits annually per 1,000 population. Persons in agriculture report only 83 visits per 1,000 population, with a maximum among employed persons of 173 visits for wage and salary workers in mining. Unemployed workers and persons keeping house report a rate of visits of 222 and 231 per 1,000

Table 5. Outpatient care in general hospitals, by region and type of residence

| Region | Type of residence | | |
|---|-------------------|-------|-------|
| | All types | Urban | Rural |
| Annual number of outpatients per 1,000 population | | | |
| All regions..... | 47 | 49 | 44 |
| Northeast..... | 46 | 50 | 38 |
| North Central..... | 45 | 50 | 36 |
| South..... | 48 | 48 | 49 |
| West..... | 49 | 44 | 58 |
| Annual outpatient visits per 1,000 population | | | |
| All regions..... | 161 | 179 | 132 |
| Northeast..... | 195 | 234 | 81 |
| North Central..... | 121 | 147 | 82 |
| South..... | 157 | 137 | 177 |
| West..... | 190 | 200 | 172 |

Table 6. Annual outpatient visits in general hospitals per 1,000 population, by residence and place of care

| Residence | Place of care | | | | | | Rural | |
|------------------------------|---------------|--|----------------------|--------------------------|----------------------|------------------|------------------|---------------------|
| | All places | Standard metropolitan areas ¹ | | Urban (nonmetropolitan) | | | | |
| | | Metropolitan area of residence | | Other metropolitan areas | Places 10,000-50,000 | | | Places under 10,000 |
| | | Central city | Outside central city | | | | | |
| All areas----- | 161 | | | 9 | 20 | 14 | 18 | |
| Metropolitan areas----- | 179 | 148 | 24 | 4 | 2 | 1 | 1 | |
| Central city----- | 232 | 222 | 3 | 5 | 1 | 2 | (²) | |
| Urban fringe----- | 143 | 86 | 48 | 4 | 4 | (²) | 2 | |
| Rural nonfarm----- | 104 | 56 | 44 | 3 | 1 | 1 | (²) | |
| Rural farm----- | 69 | 47 | 12 | 1 | 10 | (²) | (²) | |
| Urban (nonmetropolitan)----- | 123 | | | 23 | 62 | 32 | 6 | |
| Places 10,000-50,000----- | 133 | | | 30 | 98 | 5 | 1 | |
| Places under 10,000----- | 112 | | | 15 | 19 | 65 | 12 | |
| Rural (nonmetropolitan)----- | 145 | | | 17 | 35 | 31 | 62 | |
| Nonfarm----- | 144 | | | 19 | 41 | 27 | 57 | |
| Farm----- | 146 | | | 15 | 25 | 37 | 69 | |

¹ Includes a central city of at least 50,000 population with contiguous counties socially and economically integrated therewith, as defined by the Bureau of the Census.

² Less than 0.5.

population. Persons unable to work report an annual rate of 822 outpatient visits, an average of slightly more than 1 visit per month per person in this group receiving care.

Ecologic Factors

Geographic region and type of residence have a limited effect on the number of outpatients but a very substantial effect on the number of outpatient visits (table 5).

The number of outpatients among persons who live in rural areas is low in the Northeast and North Central regions of the country (38 and 36 annually per 1,000 population), but is well above national averages in the South and West (49 and 58 annually per 1,000 population).

These differentials apply also to total outpatient visits of rural people. On the other hand, urban residents in the Northeast and West have a comparatively high number of outpatient visits annually (234 and 200 per

1,000 population). Rates are well below the national average for urban persons in the North Central region and in the South (147 and 137 visits annually per 1,000 population).

Type of residence and place of care, as they reflect accessibility, materially affect the level of outpatient visits (table 6).

The annual rate of outpatient visits from all types of residence in all places of care is 161 per 1,000 population.

Persons living in the central city of metropolitan areas report a rate of 232 visits. Outpatient visits drop to 143 for urban fringe residents and reach a low of 69 for persons from farms in the outer limits of metropolitan areas.

Outpatient visits by persons living in cities of 10,000-50,000 population not in metropolitan areas are reported at 133, while visits by persons living in nonmetropolitan rural areas are reported at 145 per 1,000 population.

Residents of the urban fringe of metropolitan areas make about three-fifths of their

total outpatient visits within the central city of the metropolitan area in which they live. Urban and rural residents of nonmetropolitan areas obtain the major portion of their outpatient care in their home communities, although from 10 to 20 percent of such care is obtained in metropolitan areas.

Economic Factor

Income and family status have a substantial relation to the level of outpatient care received, at least with respect to the number of visits (table 7).

Among members of primary families, that

is, persons related by blood, marriage, or adoption to the head of the household in which they live (3), the maximum number of outpatient visits is made by persons in the lowest income groups. The rate for all members of primary families decreases from 199 visits per 1,000 population for income groups under \$1,000 to 106 visits for the income range \$5,000-\$10,000. Families with incomes over \$10,000 are reported at an increased rate of 144 visits.

Children under 14 years of age in the lowest income group (under \$1,000) have a very low rate of visits (59 per 1,000 population), although adults in families in this income group

Table 7. Outpatient care in general hospitals, by income, family status, and age

| Income ¹ | Family status ² and age | | | |
|---|------------------------------------|---------------------------|------------------------|---------------------|
| | Members of primary families | | | Primary individuals |
| | All members | Members 14 years and over | Members under 14 years | |
| Annual number of outpatients per 1,000 population | | | | |
| All incomes..... | 46 | 42 | 57 | 60 |
| Under \$1,000..... | 41 | 46 | 27 | 81 |
| \$1,000-\$1,999..... | 49 | 47 | 53 | 65 |
| \$2,000-\$2,999..... | 50 | 47 | 56 | 45 |
| \$3,000-\$3,999..... | 49 | 43 | 62 | 42 |
| \$4,000-\$4,999..... | 48 | 42 | 60 | 35 |
| \$5,000-\$7,499..... | 45 | 37 | 61 | 51 |
| \$7,500-\$9,999..... | 46 | 41 | 61 | |
| \$10,000 and over..... | 44 | 43 | 48 | |
| Income not reported..... | 34 | 29 | 52 | 26 |
| Annual outpatient visits per 1,000 population | | | | |
| All incomes..... | 151 | 160 | 128 | 328 |
| Under \$1,000..... | 199 | 256 | 59 | 545 |
| \$1,000-\$1,999..... | 197 | 202 | 185 | 395 |
| \$2,000-\$2,999..... | 194 | 211 | 156 | 183 |
| \$3,000-\$3,999..... | 146 | 139 | 159 | 152 |
| \$4,000-\$4,999..... | 177 | 200 | 133 | 144 |
| \$5,000-\$7,499..... | 106 | 102 | 114 | 89 |
| \$7,500-\$9,999..... | 105 | 110 | 90 | |
| \$10,000 and over..... | 144 | 167 | 68 | |
| Income not reported..... | 119 | 126 | 97 | 47 |

¹ For members of primary families, "income" includes money income of all members of the family; for primary individuals, it includes personal income only.

² Primary family members include persons related by blood, marriage, or adoption (one of these persons being the head of the household). Primary individuals are heads of households not living with relatives (see reference 3).

report a level more than 4 times as great. Except for this lowest income group, the data reported for primary families show rather close parallels for annual outpatient visits by children and adults.

Primary individuals, that is, heads of households not living with relatives (9), with incomes under \$2,000 report a rate of outpatient visits greatly in excess of the outpatient visits made by adults in primary families with similar incomes. The rate reported among primary individuals in the income group under \$1,000 is 545 visits per 1,000 population; among those in the group \$1,000-\$1,999, it is 395 visits per 1,000 population.

Summary

This is the second interim report on a national household survey of the use of general hospitals by a known population. Data have been compiled from a sample comprised of about 27,000 families, including about 90,000 persons of all ages. This report records provisional findings on factors related to the level of outpatient visits to general hospitals. These factors include demographic, ecologic, and economic aspects.

The most significant contrasts in level of outpatient use appear for variations in income levels. Families with incomes below \$2,000 are reported as making about 200 outpatient

visits annually per 1,000 population, while those with incomes between \$5,000 and \$10,000 report about one-half of this rate. Primary individuals (household heads not living with relatives) in the income groups below \$2,000 report outpatient visits at a level double that of adults in primary families with the same income.

Substantial differences in the rate of outpatient visits accompany variations in race, sex, age, and employment status. Place of residence appears also to have a considerable effect on the rate of outpatient visits. The rate is highest for residents of the central city in metropolitan areas and lowest for the rural farm population in metropolitan areas. The rate of outpatient visits for the farm population outside metropolitan areas is only slightly below the national average for all persons.

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New Site for National Library of Medicine

The proposed new building for the National Library of Medicine will be constructed on the grounds of the Public Health Service's National Institutes of Health in Bethesda, Md. Selection of a site for the library was made by the board of regents of the library at its second meeting on April 29, 1957.

Factors leading to the choice of the specific site were its proximity to two large medical centers, the availability of sufficient land, a good network of transportation, and established supporting services and facilities.

Climate and Fluid Intake

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NUMEROUS investigators have studied the physiological reaction of adults to specific temperature, humidity, and other variable climatic conditions (1, 2). These studies, initiated primarily by the U. S. Armed Forces, have been concerned largely with man's comfort, efficiency, or survival in the desert, arctic, or other places with severe climatic conditions. There have been a few investigations of the physiological response of children to heat stress under laboratory (3) and normal living conditions (4, 5), but data are too limited to describe adequately the influence of climatic factors on the amount and kind of fluid consumed by this group.

Interest in the physiological response of children to climate increased markedly with the advent of community water fluoridation. Epidemiological studies in natural fluoride areas have shown that 1 p.p.m. fluoride represents the optimum level for dental caries con-

trol in most of the United States (6). However, it has been suggested that in the practical application of the findings less than 1 p.p.m. may be sufficient to give optimum protection in very warm areas because of increased water consumption (7).

Galagan and Lamson (8) using two biological indexes (fluorosis and dental caries) found that Arizona children, living in a climate where the mean annual temperature is approximately 70° F., had a higher fluorosis index and a lower caries rate than children who used water with the same fluoride concentration but who lived in the midwest where the mean annual temperature is 50° F. They concluded that the Arizona residents drink more water than children living in the more temperate climate.

Since this finding and an earlier pilot study (5) indicated that climatic factors do influence water consumption in children, it was decided to investigate the relationship between climate and fluid intake more extensively by measuring, under normal living conditions, the actual amounts of fluid consumed by a large number of children exposed to varying climatic conditions. The study was undertaken jointly by the Public Health Service and the Contra Costa County (Calif.) Health Department, with active support from superintendents, principals, teachers, and nurses of local schools and members and officers of local parent-teacher associations.

The Field Study

Antioch and Brentwood in Contra Costa County, Calif., were selected as study sites. Both communities experience temperatures

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Dr. Henrik L. Blum, health officer of Contra Costa County, assisted in carrying out the study reported in this paper. Dewey DiMartini, Mrs. Elsie M. Green, and Mrs. Evelyn G. Ackerman served as volunteer weather observers in Brentwood, and Edward C. Jennings, in Antioch.

above 90° F. each summer, and both have mild winters, but there is enough difference between the winter and summer months to permit evaluation of seasonal change.

In a series of thirty-nine 5-day study periods during approximately 1 year, records of fluid intake were obtained for 316 Antioch and 139 Brentwood children. In Antioch, there were 27 periods, Monday through Friday, every other week, from November 30, 1953, through December 3, 1954. In Brentwood, data were obtained for one 5-day week each month from January 25, 1954, through December 10, 1954.

The participating children were divided into study groups of 12, a boy and girl in each of 6 age groups ranging from infancy through 10 years. The fluid consumed by each child was recorded for a 5-day period. No child participated for more than one period. With a few exceptions, the participants were distributed equally by sex throughout all six age groups in each study period. In a few instances records were maintained for a given child for fewer than 5 days, and occasionally fewer than 12 children participated in a group. All calculations take these irregularities into account. The age and sex distribution of participants is shown in table 1.

Table 1. Number of participants, by age and sex, Antioch and Brentwood, Calif.

| Age in years | Antioch | | | Brentwood | | |
|--------------|---------|------|-------|-----------|------|-------|
| | Total | Boys | Girls | Total | Boys | Girls |
| All ages | 316 | 156 | 160 | 139 | 68 | 71 |
| Under 1 | 54 | 27 | 27 | 19 | 8 | 11 |
| 1-2 | 52 | 25 | 27 | 24 | 12 | 12 |
| 3-4 | 54 | 27 | 27 | 24 | 12 | 12 |
| 5-6 | 54 | 27 | 27 | 24 | 12 | 12 |
| 7-8 | 51 | 26 | 25 | 24 | 12 | 12 |
| 9-10 | 51 | 24 | 27 | 24 | 12 | 12 |

The children studied were selected from a roster of potential participants for each town. The rosters were divided into sections according to sex and age groups, and the names of the children in each section were arranged alphabetically. In accordance with a prescribed sampling procedure, the names of possible participants were drawn from the roster. If the

parents of a selected child did not agree to participate during the full 5-day period, an alternate child was chosen. Children who were known to be ill were excluded, especially if they had fever. Since participation in the study was voluntary, the children included do not necessarily comprise a sample representative of all children in the two communities.

Each participant was visited at home at least three times. The first visit was made to obtain a firm commitment from the parents that their child would participate and to instruct the parents and the child how to measure and record fluid intake. A plastic cup, calibrated in fluid ounces, and a record book were given to the parents. For each school child, a collapsible cup, also calibrated in fluid ounces, and an additional booklet were issued to the child's teacher, who was given the same instructions as the parents. Teachers of kindergarten and first-grade children maintained the records during school hours, but children in the second grade and above usually maintained their own fluid consumption records, with some teacher supervision.

The second visit took place at the midpoint of the recording period. The child was weighed, any problems in maintaining the fluid-consumption record were discussed, and the record was checked for obvious errors or omissions. The third visit was made at the end of the recording period. The fluid-consumption records were collected from the homes and the schools and were given a final review at this time.

The amount of fluid consumed was recorded in eight categories. The first five categories included either water in its natural form or substances to which water is added in the home: drinking water, formula preparations for babies or reconstituted milk made with water, juices diluted with water, soups diluted with water, and other water-based beverages such as tea or coffee. The other three categories included beverages which do not have water added in the home: carbonated beverages, juices not diluted with water, and other beverages such as whole milk. Water used in cooking, such as that added to vegetables, was not recorded.

The United States Weather Bureau installed

Table 2. Body weight and amount of all fluids and of water consumed per child, by sex and age, Antioch and Brentwood, Calif.

| Sex and age in years | Antioch | | | | | | Brentwood | | | | | |
|----------------------|----------------------|--------------------|---|--------------------|--|--------------------|----------------------|--------------------|---|--------------------|--|--------------------|
| | Body weight (pounds) | | All fluids (ounces per day per pound body weight) | | Water (ounces per day per pound body weight) | | Body weight (pounds) | | All fluids (ounces per day per pound body weight) | | Water (ounces per day per pound body weight) | |
| | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| <i>Boys</i> | | | | | | | | | | | | |
| Under 1---- | 18.0 | 3.4 | 1.77 | 0.53 | 0.39 | 0.46 | 15.9 | 4.4 | 2.01 | 0.58 | 0.81 | 0.60 |
| 1-2----- | 30.6 | 3.9 | 1.00 | .35 | .44 | .26 | 29.4 | 3.1 | .96 | .23 | .33 | .15 |
| 3-4----- | 37.6 | 4.1 | .94 | .31 | .39 | .19 | 39.4 | 5.6 | .76 | .16 | .38 | .15 |
| 5-6----- | 53.9 | 9.0 | .90 | .29 | .38 | .19 | 49.6 | 8.2 | 1.12 | .50 | .53 | .29 |
| 7-8----- | 65.5 | 13.7 | .80 | .24 | .40 | .20 | 66.8 | 8.9 | .72 | .25 | .39 | .18 |
| 9-10----- | 78.9 | 13.3 | .64 | .17 | .34 | .13 | 77.5 | 8.2 | .73 | .25 | .42 | .29 |
| <i>Girls</i> | | | | | | | | | | | | |
| Under 1---- | 17.6 | 3.3 | 1.67 | .53 | .53 | .56 | 16.3 | 1.9 | 2.00 | .56 | .80 | .70 |
| 1-2----- | 28.0 | 4.0 | 1.17 | .53 | .43 | .33 | 27.6 | 5.0 | 1.11 | .66 | .44 | .35 |
| 3-4----- | 38.0 | 5.8 | .97 | .33 | .41 | .23 | 37.0 | 5.1 | .70 | .21 | .33 | .20 |
| 5-6----- | 49.5 | 11.9 | .87 | .36 | .39 | .19 | 50.5 | 5.2 | .85 | .26 | .31 | .15 |
| 7-8----- | 65.1 | 12.9 | .74 | .22 | .36 | .20 | 61.2 | 15.5 | .76 | .23 | .40 | .21 |
| 9-10----- | 81.2 | 18.6 | .64 | .26 | .33 | .17 | 72.7 | 11.6 | .73 | .43 | .38 | .23 |

and maintained the equipment needed for recording climatologic observations in each community. The equipment consisted of maximum and minimum thermometers, wet and dry bulb thermometers, a fan, and a hygrothermograph for recording temperature and humidity continually during a 24-hour period. Since the Weather Bureau staffs its weather stations with volunteers, volunteers were recruited in each community to serve as weather observers. They read the wet and dry bulb thermometers and recorded the dew point three times each day, 9 a. m., noon, and 5 p. m. They read the maximum and minimum thermometers once each day and recorded rainfall whenever it occurred. The data from the hygrothermograph were checked against the manual observations, and any necessary changes were made in the data according to procedures outlined by the Weather Bureau climatologist.

Climatologic Findings

Two of the most common expressions of climate are temperature and humidity. However, no one of the many measures of temperature or

humidity is recognized as the best measure of these factors. Among the possible ways temperature or humidity can be expressed are the 24-hour mean, the 7 a. m. to 6 p. m. mean, the daily maximum, the mean of the maximum and the readings on the hours preceding and following the hour in which the maximum occurs, the 3 p. m. reading, and the daily mean calculated by averaging the maximum and minimum.

From a practical standpoint, all six measures could not be used in the analysis. To identify the ones that reflect most accurately the climatic conditions to which the children in the study were exposed, rank order correlations of these measures were done.

For temperature, an average of each of the aforementioned expressions was calculated for each observation period during which fluid-intake records were maintained, and each of the measures was then ranked according to the period in which the particular expression ranked highest, next highest, and so on. Coefficients of concordance were 0.986 for Antioch and 0.975 for Brentwood. Since the correlation between the rankings of the various temperature expressions is so high, it may be concluded

that any one of the measures is as good as any other to describe the temperature factor in this climatic environment. The daily maximum temperature is used here since it reflects the extremes of heat to which an individual is exposed and since it is a measure generally available wherever weather observations are recorded.

For the rank order correlation of humidity expressions, minimum humidity was used instead of maximum humidity since the latter approached 100 percent at some time nearly every day, particularly in the early morning hours. The result of the correlation is similar to that for temperature, and it is concluded that any one of these measures of humidity adequately describes the humidity factor in this climatic environment.

It has been assumed by many investigators that humidity has an important effect on fluid intake, although the extensive observations re-

Table 3. Percentage distribution of ounces of each kind of fluid consumed,¹ Antioch and Brentwood, Calif.

| Kind of fluid consumed | Antioch | Brentwood |
|----------------------------|--------------------|--------------------|
| All fluids----- | ² 100.0 | ³ 100.0 |
| Drinking water----- | 33.8 | 36.4 |
| Water based beverages----- | 9.6 | 11.2 |
| Milk----- | 47.9 | 39.9 |
| Carbonated beverages----- | 3.0 | 3.6 |
| Other fluids----- | 5.7 | 8.9 |

¹ During 1,539 child-days in Antioch and 681 in Brentwood.

² 61,810 ounces.

³ 27,044 ounces.

ported by Adolph indicate otherwise (1). It was hoped that this study would provide additional information on the subject. However, combinations of high temperature and high humidity, which would be required to detect any

Table 4. Percentage distribution of participants by ounces of all fluids, water, and all other fluids consumed per day per pound of body weight, November-March and April-October, Antioch and Brentwood, Calif.

| Ounces fluid consumed per day per pound of body weight | Antioch | | | | | | Brentwood | | | | | |
|--|-----------------------------|-------|------------------------|----------------------------|-------|------------------------|-----------------------------|-------|------------------------|----------------------------|-------|------------------------|
| | November-March ¹ | | | April-October ² | | | November-March ³ | | | April-October ⁴ | | |
| | All fluids | Water | All other fluids | All fluids | Water | All other fluids | All fluids | Water | All other fluids | All fluids | Water | All other fluids |
| Total----- | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Less than 0.2----- | 0 | 34.3 | 6.4 | 0 | 15.3 | 8.0 | 0 | 39.7 | 8.6 | 0 | 13.6 | 9.9 |
| 0.2-0.3----- | 5.0 | 42.9 | 30.8 | 0 | 34.8 | 24.4 | 3.4 | 32.8 | 36.3 | 2.5 | 33.2 | 32.2 |
| 0.4-0.5----- | 20.0 | 12.1 | 25.7 | 11.9 | 27.8 | 29.0 | 25.9 | 13.8 | 31.1 | 12.3 | 23.5 | 22.2 |
| 0.6-0.7----- | 27.0 | 4.3 | 17.1 | 21.0 | 11.9 | 17.0 | 32.9 | 5.2 | 6.9 | 19.8 | 14.8 | 13.6 |
| 0.8-0.9----- | 15.0 | 4.3 | 6.4 | 22.1 | 3.4 | 8.0 | 19.0 | 1.7 | 1.7 | 23.5 | 6.2 | 8.6 |
| 1.0-1.1----- | 8.6 | 0 | 4.3 | 15.3 | 3.4 | 4.5 | 1.7 | 0 | 5.2 | 14.8 | 2.5 | 11.1 |
| 1.2-1.3----- | 7.9 | 1.4 | .7 | 13.1 | 1.1 | 3.4 | 1.7 | 1.7 | 1.7 | 6.2 | 2.5 | 1.2 |
| 1.4-1.5----- | 5.0 | 0 | .7 | 4.0 | .6 | 1.7 | 1.7 | 1.7 | 3.4 | 6.2 | 2.5 | 0 |
| 1.6-1.7----- | 2.9 | .7 | 2.9 | 3.4 | 1.7 | 1.7 | 0 | 3.4 | 3.4 | 2.5 | 0 | 0 |
| 1.8-1.9----- | 2.9 | 0 | .7 | .6 | 0 | 0 | 6.9 | 0 | 1.7 | 4.9 | 0 | 1.2 |
| 2.0-2.1----- | 3.6 | 0 | 2.9 | 3.4 | 0 | .6 | 0 | 0 | 0 | 2.5 | 1.2 | 0 |
| 2.2-2.3----- | 1.4 | 0 | .7 | .6 | 0 | 1.1 | 1.7 | 0 | 0 | 2.5 | 0 | 0 |
| 2.4-2.5----- | 0 | 0 | 0 | 2.8 | 0 | 0 | 1.7 | 0 | 0 | 1.2 | 0 | 0 |
| 2.6-2.7----- | 0 | 0 | .7 | .6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.8-2.9----- | .7 | 0 | 0 | .6 | 0 | .6 | 1.7 | 0 | 0 | 0 | 0 | 0 |
| 3.0-3.1----- | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 | 0 | 0 | 0 | 0 | 0 |
| 3.2 or more----- | 0 | 0 | 0 | 5.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

¹ Number of participants: 140; mean maximum temperature: 59.7° F.; temperature range: 56.6°-62.2° F.

² Number of participants: 176; mean maximum temperature: 82.3° F.; temperature range: 74.1°-95.5° F.

³ Number of participants: 58; mean maximum temperature: 58.6° F.; temperature range: 56.8°-62.2° F.

⁴ Number of participants: 81; mean maximum temperature: 85.6° F.; temperature range: 79.2°-97.6° F.

⁵ 3.4 ounces.

Table 2. Body weight and amount of all fluids and of water consumed per child, by sex and age, Antioch and Brentwood, Calif.

| Sex and age in years | Antioch | | | | | | Brentwood | | | | | |
|----------------------|----------------------|--------------------|---|--------------------|--|--------------------|----------------------|--------------------|---|--------------------|--|--------------------|
| | Body weight (pounds) | | All fluids (ounces per day per pound body weight) | | Water (ounces per day per pound body weight) | | Body weight (pounds) | | All fluids (ounces per day per pound body weight) | | Water (ounces per day per pound body weight) | |
| | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| <i>Boys</i> | | | | | | | | | | | | |
| Under 1---- | 18.0 | 3.4 | 1.77 | 0.53 | 0.39 | 0.46 | 15.9 | 4.4 | 2.01 | 0.58 | 0.81 | 0.60 |
| 1-2----- | 30.6 | 3.9 | 1.00 | .35 | .44 | .26 | 29.4 | 3.1 | .96 | .23 | .33 | .15 |
| 3-4----- | 37.6 | 4.1 | .94 | .31 | .39 | .19 | 39.4 | 5.6 | .76 | .16 | .38 | .15 |
| 5-6----- | 53.9 | 9.0 | .90 | .29 | .38 | .19 | 49.6 | 8.2 | 1.12 | .50 | .53 | .29 |
| 7-8----- | 65.5 | 13.7 | .80 | .24 | .40 | .20 | 66.8 | 8.9 | .72 | .25 | .39 | .18 |
| 9-10----- | 78.9 | 13.3 | .64 | .17 | .34 | .13 | 77.5 | 8.2 | .73 | .25 | .42 | .29 |
| <i>Girls</i> | | | | | | | | | | | | |
| Under 1---- | 17.6 | 3.3 | 1.67 | .53 | .53 | .56 | 16.3 | 1.9 | 2.00 | .56 | .80 | .70 |
| 1-2----- | 28.0 | 4.0 | 1.17 | .53 | .43 | .33 | 27.6 | 5.0 | 1.11 | .66 | .44 | .35 |
| 3-4----- | 38.0 | 5.8 | .97 | .33 | .41 | .23 | 37.0 | 5.1 | .70 | .21 | .33 | .20 |
| 5-6----- | 49.5 | 11.9 | .87 | .36 | .39 | .19 | 50.5 | 5.2 | .85 | .26 | .31 | .15 |
| 7-8----- | 65.1 | 12.9 | .74 | .22 | .36 | .20 | 61.2 | 15.5 | .76 | .23 | .40 | .21 |
| 9-10----- | 81.2 | 18.6 | .64 | .26 | .33 | .17 | 72.7 | 11.6 | .73 | .43 | .38 | .23 |

and maintained the equipment needed for recording climatologic observations in each community. The equipment consisted of maximum and minimum thermometers, wet and dry bulb thermometers, a fan, and a hygrothermograph for recording temperature and humidity continually during a 24-hour period. Since the Weather Bureau staffs its weather stations with volunteers, volunteers were recruited in each community to serve as weather observers. They read the wet and dry bulb thermometers and recorded the dew point three times each day, 9 a. m., noon, and 5 p. m. They read the maximum and minimum thermometers once each day and recorded rainfall whenever it occurred. The data from the hygrothermograph were checked against the manual observations, and any necessary changes were made in the data according to procedures outlined by the Weather Bureau climatologist.

Climatologic Findings

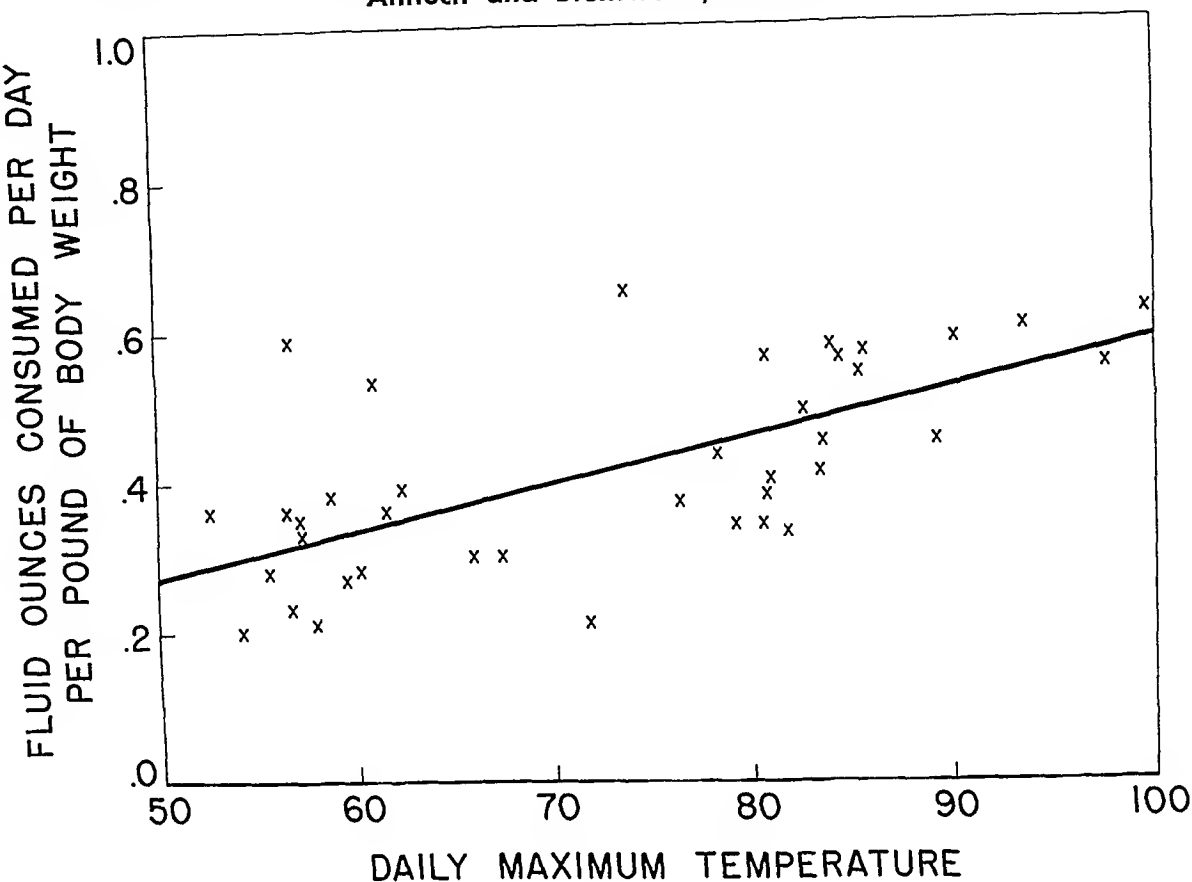
Two of the most common expressions of climate are temperature and humidity. However, no one of the many measures of temperature or

humidity is recognized as the best measure of these factors. Among the possible ways temperature or humidity can be expressed are the 24-hour mean, the 7 a. m. to 6 p. m. mean, the daily maximum, the mean of the maximum and the readings on the hours preceding and following the hour in which the maximum occurs, the 3 p. m. reading, and the daily mean calculated by averaging the maximum and minimum.

From a practical standpoint, all six measures could not be used in the analysis. To identify the ones that reflect most accurately the climatic conditions to which the children in the study were exposed, rank order correlations of these measures were done.

For temperature, an average of each of the aforementioned expressions was calculated for each observation period during which fluid-intake records were maintained, and each of the measures was then ranked according to the period in which the particular expression ranked highest, next highest, and so on. Coefficients of concordance were 0.986 for Antioch and 0.975 for Brentwood. Since the correlation between the rankings of the various temperature expressions is so high, it may be concluded

Relationship between daily maximum temperature and water intake among children, Antioch and Brentwood, Calif.



negative relationship, significant at the 5 percent level, was demonstrated between other fluids (milk and all other fluids which do not contain water added in the home except carbonated beverages) and temperature, both with and without body weight equated.

The only major differences found for Brentwood were these: Temperature did not correlate significantly with carbonated beverages or with other fluids (as defined in the preceding paragraph); correlations of temperature with total fluid and with drinking water were significant at the 5 percent level without body weight equated and at the 1 percent level with body weight equated.

The significant negative correlation demonstrated in Antioch between temperature and intake of fluids other than water, water-based beverages, and carbonated beverages may result from a decrease in intake of milk as tempera-

ture increases and water and cooling drinks are substituted for milk. This pattern of behavior has been observed previously in infants (3).

Of primary interest are the water consumption data in table 4 for two periods, November through March, when the temperature averaged 60° F., and April through October, when the temperature averaged 82° F. A decided shift to greater water intake during the higher temperature period is reflected in these data. However, under conditions of both high and low temperature, more than 90 percent of the children drank less than 1 ounce of water per day per pound of body weight. No such shift was discernible in the consumption of fluids other than water.

The relationship between temperature and water consumption is shown more precisely in table 5 and in the chart. The plotted points on this chart represent the mean amounts of water

possible additional effect of humidity on fluid intake, did not occur in the study communities. For example, in Antioch there were 66 hourly observations of temperatures of 90° F. or higher during the recording periods. For the same hours, humidity did not exceed 39 percent and often went below 20 percent. Analysis of the relationship between humidity and fluid intake will not be presented since a correlation between the mean maximum temperature and the mean minimum humidity in each community demonstrated an inverse relationship approaching unity. This inverse relationship between temperature and humidity is not limited to the western United States; in fact, it appears to be a common phenomenon (9, 10).

Studies of man in the tropics indicate that relative humidity up to 80 percent does not add to thermal stress (1). It is unlikely, therefore, that humidity has an important influence on fluid intake among children. However, further study of the possible independent effect of humidity on fluid intake in areas where high temperature and high humidity occur simultaneously may be indicated. One such area is adjacent to the Gulf of Mexico.

Temperature and Fluid Intake

In this report the term "temperature" refers to mean maximum temperature for the periods that data on fluid intake were recorded. The term "fluid" refers to all fluids consumed. Other types of fluids are mentioned specifically by name when comments refer to them. Data for both Antioch and Brentwood are presented in each table, but unless otherwise specified only the Antioch data are discussed. Since fewer than half as many observations were made in Brentwood as in Antioch, the Brentwood data do not have the same degree of reliability as those for Antioch. Generally speaking, the findings for Antioch hold true for Brentwood.

Both total fluid intake and water intake per pound of body weight decreased with increase in age, as shown in table 2. This decrease resulted mainly from the increase in body weight with age, not from an actual decrease in the total amount of fluid consumed. Correlations of both total fluid intake and water intake with

body weight are significant at the 1 percent level, although the correlations are not unity. Thus, a 10-year-old child drinks more fluid than an infant, but not in direct proportion to the weight difference between the two individuals. No important differences between boys and girls in the amount of fluid consumed are apparent.

Water accounted for about 43 percent of the total fluid consumed (table 3). Slightly less than one-half of the fluid consumed was milk. This amount represents fluid milk and does not include formula preparation made with a water base or with powdered milk reconstituted with water. Carbonated beverages and other fluids combined made up less than 9 percent of the fluid intake of the children.

Table 5. Mean maximum temperature and water intake for each recording period, Antioch and Brentwood, Calif.

| Mean maximum temperature for recording period | Ounces of water consumed per child per day per pound of body weight | Mean maximum temperature for recording period | Ounces of water consumed per child per day per pound of body weight |
|---|---|---|---|
| <i>Antioch</i> | | | |
| 52.6----- | 0.36 | 83.4----- | 0.41 |
| 54.2----- | .20 | 83.6----- | .45 |
| 55.6----- | .28 | 84.4----- | .56 |
| 56.6----- | .36 | 85.4----- | .54 |
| 57.4----- | .32 | 90.2----- | .58 |
| 58.0----- | .21 | 93.6----- | .60 |
| 58.8----- | .38 | 99.6----- | .62 |
| 60.2----- | .28 | | |
| 61.0----- | .53 | <i>Brentwood</i> | |
| 61.6----- | .36 | 56.8----- | .23 |
| 66.0----- | .30 | 56.8----- | .59 |
| 67.4----- | .30 | 57.2----- | .35 |
| 71.8----- | .21 | 59.6----- | .27 |
| 73.8----- | .65 | 62.4----- | .39 |
| 76.4----- | .37 | 79.2----- | .34 |
| 78.2----- | .44 | 80.8----- | .56 |
| 80.6----- | .34 | 82.6----- | .49 |
| 80.8----- | .38 | 84.0----- | .58 |
| 81.0----- | .40 | 85.6----- | .57 |
| 81.8----- | .33 | 89.2----- | .45 |
| | | 97.6----- | .55 |

Correlations of temperature with total fluid, with drinking water, with water-based beverages (as defined), with total water, and with carbonated beverages were significant at the 1 percent level. Correlations were equally significant when body weight was equated to account for the possible effect that weight differences might have on fluid consumption. A

Determining Optimum Fluoride Concentrations

DONALD J. GALAGAN, D.D.S., M.P.H., and JACK R. VERMILLION, M.P.H.

On the basis of the fluid intake study in Antioch and Brentwood, Calif., reported on pp. 484-490, Dr. Galagan and Mr. Vermillion, of the Public Health Service, have developed the method described here for determining optimum fluoride concentrations in water supplies. This method takes into account the effect of environmental temperature on water consumption among children.

THE FLUID intake study among children in Antioch and Brentwood, Calif., in 1953-54 provides a basis for determining the optimum fluoride concentration in water supplies in relation to environmental temperature. This study showed that for every degree increase in maximum daily temperature between 50° and 100° F. water intake increased, on the average, by 0.062 ounces per pound of body weight. For example, the average daily water consumption per pound of body weight was 0.272 ounces when the maximum daily temperature was 50° F. and 0.334 ounces when the maximum daily temperature was 60° F.

The relationship between maximum temperature and water intake for the California children was described by the estimation equation "ounces of water per pound of body weight = $-0.038 + 0.0062 \text{ temperature}$." The validity of this equation should perhaps be checked by studies in other areas of the country, but in the meantime it can be used to illustrate the calculation of optimum fluoride concentrations. As will be pointed out later in the paper, results obtained with the equation in the Chicago area, where optimum fluoride concentration is known from epidemiological studies, indicate that it is reasonably reliable.

The basic structure of the formula developed for estimating optimum fluoride concentrations is: parts per million of fluoride = opt-

imum water consumption ÷ estimated water consumption. Thus, the optimum fluoride concentration for a given community is equal to a constant (the average amount of water containing 1 p.p.m. fluoride that affords optimum protection against dental caries) divided by the estimated water consumption of children in a given community. Both measures are in ounces of water consumed daily per pound of body weight.

If daily maximum temperature data for the Chicago area are applied to the water estimation equation, it is possible to calculate a denominator value for the formula, that is, the average amount of water that would be consumed daily per pound of body weight by children in the Chicago area aged 10 years or less. The number derived, although it has no particular meaning in itself, may also serve as the constant for the formula, since it is known from epidemiological data that the optimum fluoride concentration for the Chicago area is 1 p.p.m. The constant, or numerator, in the formula must equal the estimated water consumption, or denominator, for the optimum fluoride concentration to be 1 p.p.m.

The estimated water consumption for the Chicago area children is based on weather data for two towns, Maywood and Joliet. Since both of these towns were included in the early studies of Dean (1), the fluoride concentration

consumed per child per day per pound of body weight for each recording period in each community. The line is derived from the estimation equation "ounces of water per pound of body weight = $-0.038 + 0.0062$ temperature," based on the data in table 5.

The findings for the two communities so closely approximate each other that data for both Antioch and Brentwood were used as the basis for deriving the equation that describes the relationship between temperature and water consumption. A straight line was calculated but the line should not be extended beyond the maximum temperature range of 50° to 100° F.

The line representing water consumption rises as temperature increases. This relationship has been described earlier by the positive correlation between water consumption and temperature. It may be concluded from these observations that the direct method of measuring water intake in children exposed to varying temperatures, under normal living conditions, confirms earlier observations obtained by using indirect biological measurements that the amount of water consumed by children increases with increases in temperature.

Summary

1. Records of fluid intake for 455 Antioch and Brentwood, Calif., children from infancy through 10 years of age were obtained during thirty-nine 5-day observation periods in a period of 1 year. Detailed temperature and humidity data also were obtained throughout the year.

2. Rank order correlations showed that any one of several expressions could be used to describe the climatic variables, temperature and humidity. Maximum temperature and minimum humidity were selected as the expressions of choice.

3. Humidity was associated negatively with temperature to such a high degree that it was

not possible to determine whether humidity might have some additional effect on fluid consumption in areas where high temperature and high humidity occur simultaneously.

4. Fluid intake per pound of body weight was highest among infants and decreased with age.

5. There were no substantial differences between boys and girls in the amount of fluid consumed per pound of body weight.

6. Under normal living conditions, water intake increased directly with increases in temperature.

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mum fluoride levels for ranges of mean maximum temperatures from 50° through 90.5° F. are presented in table 2. The optimum fluoride concentration for a community may be determined simply by obtaining the mean maximum temperature for a 5-year or longer period from appropriate publications of the United States Weather Bureau and then referring to this table.

Two points must be stressed in the application of this method. First, the temperature figure should be at least a 5-year average for the figure to be truly representative. Second, the mean maximum temperature in degrees Fahrenheit is the only measure that can be used since the method is based on an equation for estimating water consumption in which this measure is used.

Summary

The following formula, which takes into account variations in environmental temperature, is suggested for determining optimum fluoride concentrations for community water supplies:

$$\text{parts per million of fluoride} = \frac{0.34}{E}$$

The figure 0.34 (optimum water consumption) was calculated from data for an area where the optimum fluoride concentration is known. E is the estimated average daily water intake for children through 10 years of age in ounces per pound of body weight. It may be calculated from the estimation equation $E = -0.038 + 0.0062$ temperature, where temperature is the mean maximum temperature in degrees Fahrenheit.

A table showing suggested optimum fluoride concentrations for communities with 5-year mean maximum temperatures of 50° through 90.5° F. is presented.

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Training in Care of Prematures

The institutes for physicians and nurses in the care of premature infants at the New York Hospital-Cornell Medical Center will begin their ninth year in the fall of 1957. The institutes are sponsored by the New York State Department of Health and the Children's Bureau.

The training is designed for physicians and nurses in charge of hospital premature nurseries and premature centers, and medical and nursing directors and consultants in State and local premature programs.

Attendance at each institute is limited to six physician-nurse teams. The program for physicians lasts 2 weeks and that for nurses, 4 weeks. Participants pay no tuition fee, and stipends are provided to help cover expenses during attendance. Institutes are scheduled to start on September 30, 1957, November 18, 1957, and January 6, 1958. If the number of applicants is sufficient, fourth and fifth institutes will be scheduled, beginning March 3, 1958, and late in April or May 1958.

For additional information write to Box 143, Institute in the Care of Premature Infants, New York Hospital, 525 East 68th Street, New York 21, N. Y.

Table 1. Mean maximum temperatures and calculated optimum fluoride concentrations for selected communities in the United States

| Community | Mean maximum temperature ¹ | Calculated optimum fluoride concentration |
|---------------------------|---------------------------------------|---|
| Arizona: | | |
| Chandler Heights..... | 85.3 | 0.7 |
| Tucson..... | 82.6 | .7 |
| California: | | |
| Los Angeles..... | 73.9 | .8 |
| San Francisco..... | 61.7 | 1.0 |
| District of Columbia..... | 68.7 | .9 |
| Illinois: | | |
| Joliet..... | 61.6 | 1.0 |
| Maywood..... | 61.8 | 1.0 |
| Louisiana: | | |
| New Orleans..... | 78.7 | .8 |
| Shreveport..... | 77.7 | .8 |
| Montana: | | |
| Billings..... | 59.1 | 1.0 |
| Butte..... | 51.7 | 1.2 |
| North Carolina: | | |
| Charlotte..... | 72.7 | .8 |
| Rocky Mount..... | 73.2 | .8 |

¹ Based on temperature data for the 5-year period 1951-55 from U. S. Weather Bureau publications entitled "Climatological Data."

and the fluorosis index are known. Although both communities have more than 1 p.p.m. of fluoride in their water supplies, 1 p.p.m. is considered the optimum concentration.

The estimated average water consumption, the denominator of the formula, which is hereafter called *E*, is calculated by obtaining the mean maximum temperature for at least a 5-year period for the community in question and substituting this figure in the estimation equation $E = -0.038 + 0.0062 \text{ temperature}$. The resulting value represents the average number of ounces of water per pound of body weight that children through 10 years of age would be expected to drink daily under the temperature conditions of the community. The *E* value for both Maywood and Joliet is 0.34, and, as explained previously, this number may serve as the constant for the formula.

The value 0.34 for the constant is reasonable from the standpoint of optimum fluoride ingestion through water. For example, again in terms of average phenomena, 0.34 ounces of water fluoridated at 1 p.p.m. contains approximately 0.011 mg. of fluoride. In the fluid intake study in California, the average body

weight of children studied was about 46.5 pounds. At this weight, the children ingest about 0.5 mg. of fluoride daily through their drinking water. This amount is similar to other estimates of the amount of fluoride that should be ingested through water for optimum dental health (2). This fact tends to strengthen confidence in both the constant and the water estimation equation from which it was derived.

With the formula "parts per million of fluoride = $0.34 \div E$," optimum fluoride concentrations have been calculated for selected communities representing various geographic areas throughout the United States. The results are shown in table 1. For the cities listed, the lowest concentration, 0.7, is suggested for the Arizona communities; the highest, 1.2, for Butte, Mont.

To obtain a fluoride concentration lower than 0.7 p.p.m. with this formula, the mean maximum temperature would have to average at least 90.6° F. To obtain one greater than 1.2 p.p.m., the mean maximum temperature would have to be lower than 50° F. The possibility of the occurrence of either of these extremes in the United States seems remote. Consequently, it is not expected that the optimum concentration for any community would be outside the range 0.7-1.2 p.p.m. generally recommended for fluoridation.

In the practical application of the method described here for determining optimum fluoride concentrations, it is not necessary to make calculations for each community. Opti-

Table 2. Mean maximum temperatures and corresponding recommended optimum fluoride concentrations

| Mean maximum temperature (degrees Fahrenheit) | Recommended optimum fluoride concentration (parts per million) |
|---|--|
| 50.0-53.7 | 1.2 |
| 53.8-58.3 | 1.1 |
| 58.4-63.8 | 1.0 |
| 63.9-70.6 | .9 |
| 70.7-79.2 | .8 |
| 79.3-90.5 | .7 |

Service Statistics Series

A series of documents on the collection, analysis, and interpretation of service statistics for various health department programs is being developed by the Working Group on Service Programs, Public Health Conference on Records and Statistics.

An introduction to the series and the basic principles governing service statistics in public health appeared in June 1956, Public Health Reports, page 519. These were followed in the July issue, page 705, by a statement on service statistics for the health supervision of infants and preschool children. Statistics on health services for children of school age was the subject of the third report, published in September 1956, page 917.

In developing this fourth report, which is a guide to statistical services in the planning, administration,

and evaluation of public health services in home accident prevention, the working group had the assistance of several consultants with especial experience in programs for the prevention of home accidents.

This report was approved by the conference membership in the autumn of 1956. It was reproduced in mimeographed form as attachment A to document 370 by the National Office of Vital Statistics, Public Health Service, Department of Health, Education, and Welfare, Washington, D. C. It has the endorsement of the Statistics Section and the Committee on Administrative Practice of the American Public Health Association, the National Safety Council, and the Council of State Directors of Public Health Nursing.

In addition to assessing the extent and severity of the problem, there is need for taking stock of present activities in the field. The Proceedings of the First and Second Michigan Conferences on Home Accident Prevention (2) discuss facts, figures, and findings. The individuals, families, or groups served by public health and allied workers should also be studied. Analysis of the causes of accidental injuries and deaths is a means of identifying and substantiating specific problem areas (3-6).

The following items are suggested guides to the measurement of the problem for the purposes of emphasizing the areas in which activities might be most effective. Such measurement directs the planning of sound programs, provides the basis for needed legislation, and encourages the development of new standards through voluntary action. To be most meaningful, the suggested facts must be considered not only in themselves but also in relation to each other. These are by no means all of the facts and circumstances which may be classified for study nor does the order of their listing suggest their relative importance.

Data on area

Distribution of population by age, sex, and race.
Other descriptive information.

Data on fatal and nonfatal accidents

A complete description of the accident, the nature of the injury, and the consequences of the accident and injury will serve as a guide to measurement of the problem.

Age, sex, and race of the victim.
Activity at time of accident.
Probable cause of accident (personal or environmental factors).
Location on premises where accident occurred.
Time of day, week, or season.
Physical agent involved in accident.
Physical agent producing injury.
Manner and nature of injury.
Duration of disability.
Medical attention or hospitalization.
Wages lost, property damage, and other costs.
Medical and nursing costs.
Cause of death.
Place of death.

Data on other related factors

Sources of information such as victim, family, or neighbor.
Occupation of victim or head of household.
Physical condition of victim.
Type of home.
Location of home: urban, farm, or nonfarm.
Physical factors of general home environment.
Size of family.
Number of previous accidents.
Economic factors, if possible.
Other persons involved in accident.



For Home Accident Prevention Programs

ACCIDENTS in the home have become increasingly important as a cause of personal injury and loss of life; therefore, State and local health departments are recognizing the need for greater attention to home accident prevention. Since preventive programs are not yet being carried out to any great extent, techniques for evaluation of services are in an early stage of development. Because of the limitations in measuring certain phases of accident prevention, attention is directed here only to those items which are measurable.

While determination of program objectives does not fall within the scope of this guide, it is recognized that a long-range objective of home accident prevention is to lower the occurrence of accidental injuries, thus reducing morbidity and mortality.

It is essential to delineate that portion of the total objectives toward which the program is being directed at any one time. For example, one phase of the program may be directed toward reduction of accidents from certain causes, another toward prevention of accidents among certain population groups such as children or the aged, another toward reduction of accidents of designated severity, and still another toward increasing the awareness of accident-producing situations. Whatever the immediate focus of the program the objective should be clearly stated.

Determination of the steps toward achieving the long-term objective of a home safety program usually leads to the organization of the

program under the following general types of activity:

- Orientation and inservice training of the public health staff.
- General education of the public.
- Specific services to individuals and groups.

The job of home accident prevention belongs to all workers in the field of public health. At an early stage, program planners must enlist the help of the health educator, the statistician, and other staff service personnel. The staff should function as a part of the professional team throughout the stages of program planning, operation, and evaluation (1).

In evaluating any public health service it is necessary that there be a clear understanding on the part of all concerned regarding definition of terms used. Lack of such understanding leads to considerable loss of comparability of data and thus minimizes the value of evaluative studies. An effort is being made to standardize definitions and study is continuing through the Conference on Definitions of Accidents (2-4).

Statistical Information

Measuring Extent and Nature of Problem

For study and comparison, accident experience is best expressed in terms of both numbers and rates of death and, wherever possible, non-fatal injuries. Detailed facts about home accidents should be compiled and made available to all agencies concerned with public health.

services and the extent to which they have accomplished their purpose.

Staff orientation and inservice training

Measurable activities in staff training might include a series of lectures and demonstrations for local health department staffs by persons with special competence in home accident prevention. Material presented would include current statistics indicating the problem and reasons for integrating home accident activities with all public health work. This might be preceded and followed by written tests and field practice to determine the information level of the staff. Orientation of the staff to the use of techniques in reducing home accidents would be a part of this inservice training.

Public education activities

Public education by health authorities would include classes, lectures, exhibits, radio programs, and printed matter. This is a difficult area for which to establish objective indexes of accomplishment. However, a few suggestions for gauging increased knowledge and change in habit patterns might be measured by before and after quizzes, the use of checklists, and by counting requests for services and materials. Records of the number of requests will be more meaningful if they include a study of the characteristics of the groups being reached, with age, sex, and occupation indicated.

Because allied agencies are active in the educational phase of home accident prevention, it is difficult to pinpoint the effectiveness of health department work *per se* (10). The most valid study of the effect of materials used through mass media (radio, television, posters, pamphlets) might be made by the national agencies that develop the material (11, 12). Results of such evaluation should be available to local health departments for use in determining the educational medium to be used.

Another indication of the value of health department activities is in the number of second requests for speakers, literature, and consultation. This, of course, measures only requests for assistance, not the effect of it.

Specific services to individuals and groups

Recording of hazards, dangerous practices, and their correction (or continuation) may be included in activity reports, either routinely or by special arrangement. These records will provide evidence of home accident prevention services given to individuals or groups. To stimulate the correction of hazards, a health worker may distribute, for example, calendars for recording home accidents or Christmas tree tags with fire prevention instructions (13). He measures the effectiveness of these activities by counting the number of homes in which the calendars or tags are used. The number may not be the same as that of the homes to which the materials were sent.

Services to groups include such activities as lectures, program guidance, and panel participation.

The amount of time devoted by public health personnel in teaching home accident prevention should be measured for a short period. For example, periodic spot checks of the accident prevention content of the records of nurses and sanitarians may prove useful.

Records which need not be kept continuously but would prove valuable over a selected period of time concern referrals of individuals to specialized services and corrections effected. Suggested as examples are referrals of persons to clinics or private physicians because of poor vision or other physical handicaps, including congenital malformations and emotional disturbances.

A record of referrals and cooperative effort between groups active in home accident prevention adds meaningful evaluative information. The next logical step is the recording of the followup activities and their results. Records of referrals of environmental hazards may be those to:

- Gas companies for checking and correcting leakage, inadequate venting, or faulty operation.
- Electric companies for overloading, faulty equipment, or short circuits.
- Other fuel suppliers for inspection and correction of oil or coal furnaces and heaters.
- Municipal fire department for testing extinguishers, advice in correcting fire hazards.

Data on community knowledge and attitudes

Attitudes toward home accident prevention.

Knowledge of and attitude toward accident producing situations.

Possible ways of avoiding occurrence of similar accidents.

Suggested ways of avoiding recurrence of the accident.

Sources of health and safety information.

Because of the difficulty of measuring knowledge and attitudes little information is available. However, the bureau of maternal and child health of the New Jersey Department of Health has conducted a study designed to obtain data relating to these subjects (7).

Sources of Data

There are many limitations to be considered in determining sources of data for planning and administering a program. Questions which must be answered are (2): How reliable are the sources? Are they valid? Do they assure completeness of information?

Following are some suggested sources of data on fatal and nonfatal accidents.

Fatal accidents

- Death certificates supplemented by data collected with the National Office of Vital Statistics Home Accident Fatality Report or a similar epidemiological report.

- Hospital or emergency room reports if arrangements are made for the inclusion of detailed information about the accident.

- Reports of the medical examiner following inquiry into the circumstances of the accident.

Nonfatal accidents

- Sample surveys of homes.
- Surveys through schools, industries, service and social organizations.

- Hospital, clinic, and physician's reports, and poison information centers.

- Epidemiological reports collected by public health nurses, sanitarians, or others as a special project (8).

Measuring Effectiveness

Home accident prevention programs are not uniform; they vary with the nature of the problem and the staff available. Therefore,

the following suggestions need to be adapted accordingly.

Many of the items suggested for use in evaluation need not be collected and analyzed continuously. Periodic studies, especially of newly developed programs, are a valuable aid to program evaluation and revision.

Evaluation of home accident prevention programs has two major aspects:

- Evaluation of the entire program in relation to the long-range objectives.

- Evaluation of specific activities and services of the program in relation to the immediate objectives.

To be of maximum value, evaluation should be performed periodically. It should be followed by reexamination of the program in terms of both immediate and long-range objectives. Unsatisfactory progress indicates a need to replan the program and possibly to redefine objectives (9).

Long-Term Effect of Community Program

Collection and analysis of the following data may help gauge the effectiveness of an accident prevention program in achieving its ultimate goal:

- Trend of death rates from home accidents with respect to such factors as manner of injury, object involved, age, race, and sex.

- Indexes of change in nonfatal injuries by data from hospitals, emergency rooms, or, in some cases, from area surveys.

Caution must be used in drawing conclusions from the data. Evidence of change within a given area should not in itself be considered an adequate measure of the program's effectiveness. Comparisons with changes in a comparable area that does not have a preventive program help to strengthen the evidence regarding the effect of the program.

Effect of Health Department Services

A record of the number of activities, the time spent on them, and whatever measurable work is done does not necessarily indicate the health department's contribution to a communitywide program. It is necessary to supplement the records of the number of activities by some study of the content of the

Limitations on the Recreational Use of Domestic Water Reservoirs

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IN the public health sense, impounding reservoirs may be considered as falling into two general classes, those developed primarily for domestic water supply and those serving a whole spectrum of multipurpose uses. This paper applies only to reservoirs developed primarily for domestic water supply. In California these reservoirs are relatively few in number and represent only a small percentage of the total surface area of fresh water lakes in the State. However, their accessibility makes them especially convenient for recreational use.

In California, there is a conflict of interest in proposed recreational uses of domestic water supply reservoirs. Pressures of increasing population and increasing need for the limited water resources of the State result in an ever-growing appreciation that there must be maximum, and therefore multiple, use of our water resources. This multiple use may include recreational activities. People have more leisure time with more need for recreation than in the past, and, as cities grow larger, there is less

and less room for this recreation. For these reasons people interested in recreation desire to use all possible reservoirs and watersheds. The California State Board of Public Health officially expressed its position with respect to such use in a resolution which it adopted in 1955:

"The State Board of Health recognizes its responsibility for promoting the total health of the people of California and is cognizant of the beneficial role of adequate recreational facilities in the promotion of health. The board recognizes that in certain situations recreational use of water supplies under proper restrictions is feasible."

However, there is universal agreement that any possible damage to public health in the use of domestic water supply reservoirs must be prevented.

The California State Board of Public Health and the California State Department of Public Health neither compel nor prohibit the recreational use of domestic water supply reservoirs. Their stand is that this option is a local responsibility. In turn, the State's responsibility is to evaluate proposals for recreational use and to determine whether they provide sufficient safeguards to protect the public health.

There are two important factors to consider in this public health problem—hazards of disease transmission and esthetic considerations.

Transmission of Disease

We have considerable knowledge concerning risk of disease transmission, although it is admittedly incomplete. So far as we know, the

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• Municipal building department for advice in correcting structural defects.

• Manufacturers of household equipment, appliances, and furnishings.

Builders and contractors are among other groups offering a field for activity. In connection with new housing site inspections, recommendations for safe building and the number actually carried out provide a clue to the effectiveness of this field of work (14).

Studies

The 8 State and 4 local demonstration programs in home accident prevention, sponsored by grants from the W. K. Kellogg Foundation, have had accelerated experience in this field which may provide resources on special studies and service statistics (15). Baseline values of morbidity and mortality, activity counts, and service statistics of program activities were obtained by various methods in these demonstration programs. For additional reference and further information, health officers of the following departments or the directors of the home accident prevention programs may be contacted: local health departments—Cambridge (Mass.), Mansfield (Ohio), San Jose (Calif.), Kalamazoo (Mich.); State health departments—California, Georgia, Kansas, Kentucky, Maryland, Massachusetts, North Carolina, Oregon.

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more chlorine is required for killing Cocksackie viruses than for killing *Escherichia coli*.

The newly recognized enteric cytopathic human orphan (ECHO) viruses also are excreted in feces. The role of these viruses in causation of diseases and their manner of spreading disease are as yet undefined although some appear to cause aseptic meningitis which may be confused with poliomyelitis.

Admittedly, poliomyelitis, Cocksackie, and ECHO viruses have never been proved to have produced waterborne epidemics and thus may only be theoretical hazards in water supplies. However, the virus causing infectious hepatitis is known to have caused waterborne outbreaks. The virus of this debilitating disease may badly damage the liver, frequently producing marked and severe constitutional symptoms with prolonged convalescence. The virus never has been cultivated nor have laboratory animals been found to be susceptible so data on its survival are not available. In the massive waterborne epidemic at New Delhi, India, in spite of the presence of a good treatment plant, 10,000 cases of hepatitis occurred.

We must recognize that the public's expectation of perfect performance of water treatment plants may be unduly optimistic. Man may err and equipment may fail. Even though water treatment facilities are provided, safeguards, care, and judgment must be exercised to insure that the capabilities of the installed facilities are not exceeded. We cannot accept the philosophy that it is unnecessary to concern ourselves with the quality of raw water, that all we need to do is spend enough for water treatment facilities to produce a safe and acceptable water.

In milk sanitation, major reliance for protection of milk supplies is placed on pasteurization, but the whole milkshed must provide barriers to contamination. Cows must be guarded against disease and the milk against dirt, manure, and human contamination. The final safeguard is pasteurization.

The same general principles must apply to the production of potable water. The watershed must be protected, insuring that the water will be kept as clean as possible along each step of the route. In addition, the water finally must undergo a degree of treatment consistent with the hazards to which it has been exposed.

Further comparison might be made with fire protection in communities. In the first place, we provide ourselves with regulations concerning construction of our manmade works so that fire hazards are reduced as much as is economically practical. Second, sufficient quantities of water and adequately manned fire-fighting facilities are provided to extinguish any fires which may occur. Finally, there is continuing surveillance and inspection. These examples illustrate the philosophy of providing factors of safety. It is not permissible so to lower factors of safety as to compromise the health and safety of the public.

Esthetic Considerations

The California State Department of Public Health recently had an inquiry from a person who asked why some of our water supply reservoirs were not open for swimming and bathing. In part, the department replied that the public is unwilling to accept such use of its domestic water supply reservoirs. The interest of the swimming recreationalists, on one hand, and the interest of the water consumer, on the other hand, are incompatible. Under such circumstances the conservative point of view should prevail. Therefore, it is more important to satisfy the esthetic senses of the thousands of water users than to develop unrestricted use of water supply reservoirs which seriously degrades the esthetic quality of the water.

The California State Board of Public Health, in whose hands the legislature has placed the responsibility for granting permits to water purveyors, is limited in its action by the State law which, in section 4016 of the Health and Safety Code, states: "If . . . the board determines, as a fact, that the water furnished or supplied or proposed to be supplied is such that under all the circumstances and conditions it is impure, unwholesome or unpotable or may constitute a menace or a danger to the health or lives of human beings, or the existing or proposed plants, works, system or water supply are unhealthful or insanitary, or not suited to the production or delivery of healthful, pure and wholesome water at all times, it shall deny the permit and order the petitioner to make changes as necessary to secure a continuous sup-

major disease potential in recreational use of water supply reservoirs is from improper disposal of human wastes, especially the feces, of those using the reservoir and watershed area. The inability to control all wastes leaves a potential hazard of some disease transmission.

Experience with water supply reservoirs in California now used for recreation has demonstrated that absolute control of human wastes has never been achieved. If control is lax, feces may be deposited directly in the water or on watershed lands. The hazard from the deposition of feces on land is obvious: falling rains and surface runoff will carry the material into the reservoir, pathogenic organisms may travel to the point of water intake from the reservoir, and, unless they are destroyed or removed by treatment, they may ultimately flow to the consumer.

When conditions exist which permit fecal discharges to enter raw water, it is important to know the fate of the pathogenic organisms. Using *Salmonella typhosa* as an example, the literature related to its survival in feces, soil, and water is of interest. Various conflicting reports have been summarized by Rudolfs and his co-workers from Rutgers University (1). From their summary, two things are clear: The bacteria may survive for periods as long as 100 days in feces or on soil, and the bacteria survive longer in pure water than in polluted water. This second observation is of critical importance to the waterworks industry, as pointed out by Taylor (2), who wrote: "Pollution of pure or purified waters at waterworks, in service reservoirs, or in mains is thus particularly dangerous, and the most stringent precautions are necessary to protect water prepared for delivery to consumers."

The clean water of many domestic water supply reservoirs and of all distribution reservoirs provides minimal biological competition for pathogenic micro-organisms which may contaminate it. Therefore, the opportunities for survival of pathogens are greater. On the other hand, in large impounding reservoirs and natural lakes, the factors of time, dilution, and sedimentation can enable recreational use of water without compromising the quality of the water as withdrawn for treatment. Water supply intakes must be protected by establishing a

closed area around them to prevent direct introduction of contaminating materials. Furthermore, care must be given to the location and design of the intake works to take advantage of the factors of time, dilution, and sedimentation.

Appropriate treatment must be provided for all surface water to guard against any pathogens which may elude the natural barriers. Fortunately, *S. typhosa*, and other pathogenic bacteria, are removable from water and are destructible. Investigations and experience have shown that complete water treatment, which includes filtration and postchlorination, can produce a satisfactory finished water from a contaminated raw water. However, we would stress that public health authorities have agreed that there must be bacterial limits for "raw" water whether receiving only chlorination or complete treatment. These limits are expressed in terms of the numbers of coliform bacteria which must not be exceeded if safe water is to be produced by treatment.

While it is agreed that, if not "loaded" too heavily, complete water treatment is adequate to produce a water free from bacteria which cause typhoid fever or other enteric diseases, the problem with respect to some parasites and viruses is not equally simple. Among the parasites we may mention *Endamoeba histolytica*, which causes amebic dysentery. Although amebic cysts normally are removed by filters they are difficult to destroy by chlorine when this is the only treatment employed.

The viruses present another challenge to water safety. Filtration is much less effective in removing viruses than in removing bacteria or parasites (3, 4). While poliomyelitis virus is usually spread by contact between infected and uninfected individuals, it is often present in the feces of healthy persons and has frequently been recovered from sewage. Fortunately, free residual chlorine rapidly inactivates it. The Cocksackie viruses also have been demonstrated in urban sewage. Most Cocksackie viruses do not cause disease, though one epidemic occurred in California during 1956. Like the typhoid bacillus, Cocksackie viruses have been shown to survive longer in unpolluted than in polluted water. They have survived as long as 47 days in river water. While chlorine will inactivate these viruses, from 7 to 46 times

Survey of Animal Ringworm in the United States

ROBERT W. MENGES, D.V.M., M.P.H., and LUCILLE K. GEORG, Ph.D.

RINGWORM in animals appears to be sufficiently common in the United States to present a potential public health problem. In August 1953 a study was initiated to determine which fungi were the common causes of ringworm in animals, to obtain data concerning the epizootiology of ringworm, and to determine the role of animals in the spread of infection to man. The plan and the objectives of the study have already been described (1), and reviews of the literature on animal ringworm have been published recently (2, 3). This paper summarizes the data accumulated during the 2-year period August 1953 through August 1955.

Veterinarians in 32 States assisted in the study, collecting specimens of hair from domestic, captive, and wild animals. In most of the wild animals, skin lesions were not present.

In the laboratory, all hairs were checked with a Wood's lamp for fluorescence, and, using 10 percent potassium hydroxide, a direct microscopic examination for fungus elements was made. Following this preliminary examination, the hairs were cultured on cycloheximide medium (4) and held at 25° C. for a minimum of 1 month before being discarded as negative.

Specimens of hair from 1,073 domestic animals were cultured. Dermatophytes were isolated from 277, or 26 percent. A summary of these results is presented in table 1. In addition,

hair specimens from 1,465 wild and captive animals were cultured, and dermatophytes were isolated from 243, or 17 percent (table 2). Thus, a total of 2,538 specimens of animal hair were cultured and dermatophytes were isolated from 520, or 20 percent. Figure 1 shows the distribution of the study animals and the number positive for ringworm.

Five different pathogenic organisms were identified among the animal isolates. These included *Microsporum canis* from cats, dogs, monkeys, and a chinchilla; *Microsporum gypseum* from dogs, mice, and rats; *Trichophyton mentagrophytes* from dogs, chinchillas, guinea pigs, a kangaroo, mice, rats, and an opossum; *Trichophyton equinum* from horses; and *Trichophyton verrucosum* from cattle and a burro. In addition, a variety of *M. gypseum* which was designated *M. gypseum* (red variety) was isolated from rats and mice. Dr. L. Ajello, of the Communicable Disease Center's Mycology Unit, describes this variety as a new species. A similar organism has been isolated from soil obtained from Idaho and Washington by Cooke (5), from Michigan by Ajello, and from Georgia by Menges (6).

Lesions were found in 408 of the 520 animals with ringworm. Scaling, circular lesions with alopecia were most common. The most common locations of the lesions were the head, the neck, and the leg.

The animal hairs were examined by culture, by direct microscopic examination, and by Wood's lamp for fluorescence. Of 290 cases which were positive by culture, only 117 (40 percent) were positive by direct microscopic

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ply of pure, wholesome, potable, and healthful water."

My point in quoting this is to refer to the adjectives "wholesome" and "potable." The State board of public health holds that wholesomeness and potability also include esthetic considerations. When the water-consuming public considers that certain uses of sources of water are repugnant, then it is quite obvious that the water derived from these sources cannot be considered to be wholesome and potable. We must therefore recognize the feelings of the consumers, and we cannot permit uses of their water sources which are esthetically unacceptable. For this reason, the regulations which the State board of health adopted in December 1956 forbid recreational use involving "bodily contact" by man or animals.

Public Health Considerations

Wherever recreational use of water supplies is undertaken, there must be adequate control, for only with adequate control can such uses be tolerated. There must be assurance that the limits of contamination are not exceeded. Sanitary facilities adequate for the numbers of people in the area must be provided. The facilities must be convenient and they must be esthetically acceptable to the users. This includes their proper maintenance. Last but not least, there must be policing of the people in the area in order to keep their activities within limits consistent with the character of the area in which they are carrying on their recreational activities. The water purveyor must give assurance of this supervision. In addition, the local public health department having jurisdiction over the reservoir must provide appropriate public health supervision.

The State board of public health has considered matters of recreation on water supply reservoirs in the past. In 1951 it granted a permit to the city of San Diego to allow fishing on its reservoirs and in consideration of this action adopted a policy statement concerning recreation on reservoirs. At its meeting on December 7, 1956, the State board of public health formalized this earlier policy statement and adopted regulations on this subject. Problems described above have been

taken into account in the regulations, which call for (a) limiting the activities of people on the water supply reservoirs; (b) providing adequate sanitary facilities for use of the people; (c) maintaining these facilities; (d) policing the people in the area; and (e) providing an adequate degree of treatment of the water derived from these sources.

Conclusions

1. Water reservoirs may afford a healthful recreational resource for a community.

2. Because water is a vehicle of disease transmission, when a choice must be made between safe water or recreation, safe water must always prevail.

3. Recreational use of water supply reservoirs calls for a high level of supervision and control of people using the area to prevent their wastes from entering the waters.

4. Control of the recreational activities must be adequately budgeted and financed.

5. There must be adequate treatment of water derived from reservoirs.

6. Determination on the basic question of recreational use of water supply reservoirs must be made locally.

We must recognize that permitting such recreational activities constitutes a risk, but that the risk can be minimized to a reasonable and tolerable level if the conditions described are met.

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examination and 46 (16 percent) by Wood's lamp. These results emphasize the value of cultures in diagnosing ringworm infections since *Trichophyton*-infected hairs usually do not fluoresce and infected hairs may be overlooked in direct examination.

Human Contacts

An attempt was made to gather evidence of the development of skin lesions in human beings in homes where infected animals were kept.

A history of such lesions was found in 59, or 31 percent, of 192 families in homes in which 252 infected dogs and cats were kept. Presumptive ringworm was found in 14 of 120 (12 percent) of the families associated with canine cases and in 45 of 72 (63 percent) of the families associated with feline cases. This information was obtained from the owners of infected animals by the veterinarians who attended the animals and by followup studies.

Thirty-four human outbreaks were thought to be caused by infected cats and only 12 out-

Table 2. Results of culturing specimens of hair from wild and captive animals

| Animal and organism isolated | Specimens cultured | | | | | |
|--|--------------------|----------|---------|-----------------|----------|---------|
| | Total | | | No lesions | | |
| | Number cultured | Positive | | Number cultured | Positive | |
| | | Number | Percent | | Number | Percent |
| Bat ¹ | 1 | 0 | 0 | 1 | | |
| Bird ² | 3 | 0 | 0 | 2 | | |
| Bobcat ¹ | 2 | 0 | 0 | 2 | | |
| Cheetah ¹ | 1 | 0 | 0 | | | |
| Cat ¹ | 4 | 0 | 0 | 4 | | |
| Chinchilla..... | 40 | 7 | 17.5 | 21 | 0 | 0 |
| <i>Microsporum canis</i> | (40) | 1 | 2.5 | 0 | | |
| <i>Trichophyton mentagrophytes</i> | (40) | 6 | 15.0 | 0 | | |
| Fox ¹ | 7 | 0 | 0 | 7 | | |
| Gerbil ¹ | 26 | 0 | 0 | 26 | | |
| Guanaco ¹ | 1 | 0 | 0 | 1 | | |
| Guinea pig (<i>T. mentagrophytes</i>)..... | 200 | 141 | 71.0 | | | |
| Hamster ¹ | 1 | 0 | 0 | | | |
| Jerboa ¹ | 16 | 0 | 0 | 16 | 0 | 0 |
| Kangaroo (<i>T. mentagrophytes</i>)..... | 1 | 1 | 100.0 | | | |
| Meriones ¹ | 12 | 0 | 0 | 8 | 0 | 0 |
| Mice ³ | 546 | 53 | 9.7 | 545 | 53 | 9.7 |
| <i>Microsporum gypsum</i> | (546) | 2 | .4 | (545) | 2 | .4 |
| <i>Microsporum gypsum</i> (red variety)..... | (546) | 36 | 6.5 | (545) | 36 | 6.5 |
| <i>Trichophyton mentagrophytes</i> | (546) | 15 | 2.8 | (545) | 15 | 2.8 |
| Mink ¹ | 1 | 0 | 0 | | | |
| Monkey (<i>M. canis</i>)..... | 8 | 6 | 75.0 | 2 | 0 | 0 |
| Opossum (<i>T. mentagrophytes</i>)..... | 59 | 1 | 2.0 | 59 | 1 | 2 |
| Rabbit ¹ | 11 | 0 | 0 | 7 | 0 | 0 |
| Raccoon ¹ | 42 | 0 | 0 | 42 | 0 | 0 |
| Rat ⁴ | 471 | 34 | 7.2 | 455 | 34 | 7.4 |
| <i>Microsporum gypsum</i> | (471) | 2 | .4 | (455) | 2 | .4 |
| <i>Microsporum gypsum</i> (red variety)..... | (471) | 11 | 2.3 | (455) | 11 | 2.4 |
| <i>Trichophyton mentagrophytes</i> | (471) | 21 | 4.5 | (455) | 21 | 4.6 |
| Skunk ¹ | 2 | 0 | 0 | 2 | 0 | 0 |
| Squirrel ¹ | 8 | 0 | 0 | 8 | 0 | 0 |
| Woodchuck ¹ | 2 | 0 | 0 | 2 | 0 | 0 |
| Total..... | 1,465 | 243 | 17.0 | 1,210 | 88 | 7.2 |

¹ No isolations.

² Canary, western evening grosbeak (*Hesperiphona vespertina*), warbler (unknown species).

³ *Mus musculus*, *Peromyscus gossypinus*, *Peromyscus nullalli*, *Pitymys pinetorum*, *Peromyscus polionotus*, *Rheithrodontomys humilis*.

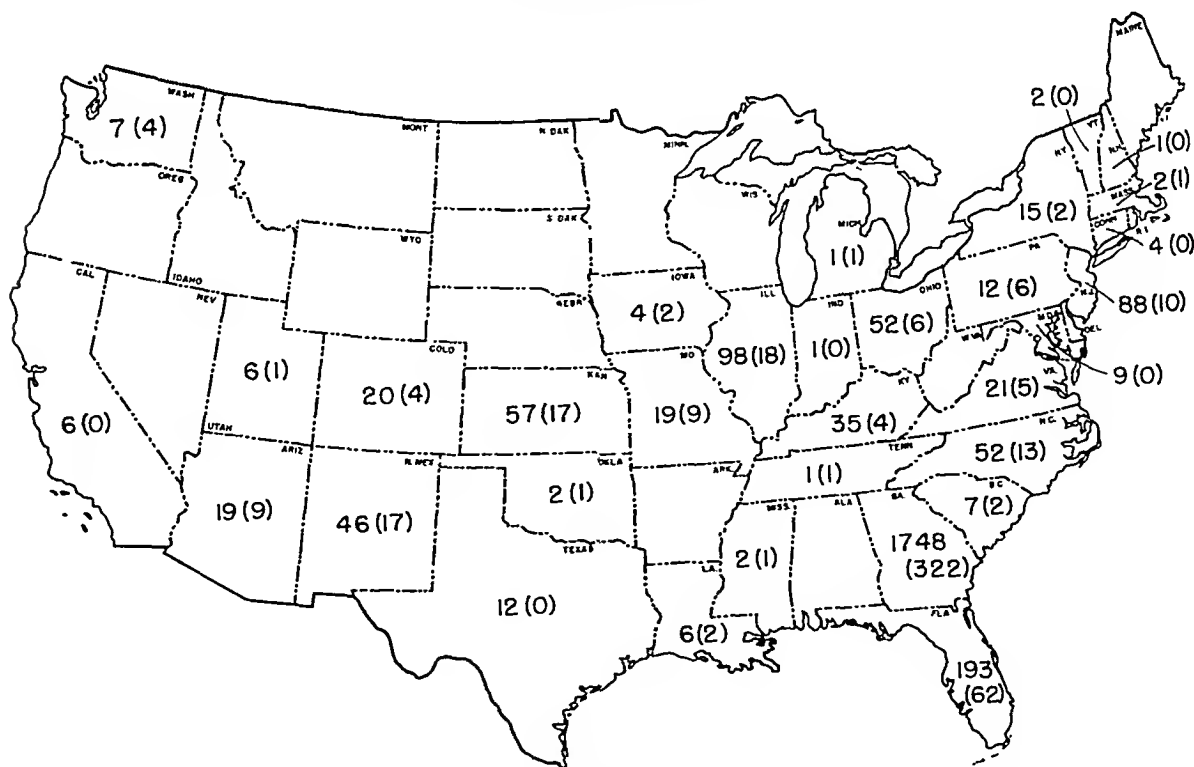
⁴ *Sigmodon hispidus*, *Rattus rattus*, *Rattus norvegicus*, *Neotoma floridans*.

Table 1. Cultural results with domestic animal specimens

| Animal and organism isolated | Specimens cultured | | | | | |
|---|--------------------|----------|---------|-----------------|----------|---------|
| | Total | | | No lesions | | |
| | Number cultured | Positive | | Number cultured | Positive | |
| | | Number | Percent | | Number | Percent |
| Cat (<i>Microsporum canis</i>) | 281 | 125 | 45 | 92 | 23 | 25 |
| Cattle (<i>Trichophyton verrucosum</i>) | 105 | 21 | 20 | 61 | 0 | 0 |
| Chicken ¹ | 2 | | | 2 | 0 | 0 |
| Dog | 641 | 127 | 19.8 | 193 | 1 | .5 |
| <i>Microsporum canis</i> | (641) | 77 | 12 | 1 | 1 | 100 |
| <i>Microsporum gypsum</i> | (641) | 46 | 7.2 | | | |
| <i>Trichophyton mentagrophytes</i> | (641) | 4 | .6 | | | |
| Horse (<i>Trichophyton equinum</i>) | 29 | 3 | 10 | 11 | 0 | 0 |
| Burro (<i>Trichophyton verrucosum</i>) | 1 | 1 | 100 | | | |
| Mule ¹ | 2 | 0 | 0 | 2 | 0 | 0 |
| Sheep ¹ | 1 | 0 | 0 | | | |
| Goat ¹ | 1 | 0 | 0 | | | |
| Swine ¹ | 10 | 0 | 0 | 8 | 0 | 0 |
| Total | 1,073 | 277 | 26 | 369 | 24 | 7 |

¹ No isolations.

Figure 1. Distribution of ringworm cases in animals in 32 States participating in survey, August 1953 to September 1955.



NOTE: Figures indicate number of animals cultured; figures in parentheses, number of positive cultures.

Table 3. Age distribution of 641 dogs infected with ringworm

| Age (years) | Number examined | Positive | |
|-----------------|-----------------|----------|---------|
| | | Number | Percent |
| Under 1..... | 181 | 71 | 39 |
| 1-2..... | 171 | 39 | 23 |
| 3-4..... | 120 | 11 | 9 |
| 5-6..... | 69 | 5 | 7 |
| 7 and over..... | 79 | 1 | 1 |
| Unknown..... | 21 | 0 | 0 |
| Total..... | 641 | 127 | 20 |

percent) of the *M. gypseum* cases were in rural areas.

Outbreaks of ringworm among groups of dogs were not common. Only one *M. canis* outbreak and two *M. gypseum* outbreaks were found in this study. All of the outbreaks occurred among litter mates.

Infections in Cats

Outbreaks of ringworm among cats were much more common than outbreaks among dogs. Ten outbreaks among cats were found in the survey; six of these occurred in breeding establishments.

Specimens of hair from 281 cats were cultured and *M. canis* was isolated from 125 (45 percent) of these. *M. canis* was the only dermatophyte isolated.

The age distribution of the cats is shown in table 4. Sixty-seven percent of the cats under 1 year of age had ringworm. Although the percentage of positive cats decreased with age, ringworm was found in cats of all ages.

There did not appear to be a marked difference in susceptibility to ringworm between the sexes. Fifty-seven (40 percent) of 144 males cultured, and 64 (49 percent) of 130 females cultured were positive. In the group under 1 year of age, 36 (68 percent) of 53 males and 34 (64 percent) of 53 females were positive. In the group aged 1-2 years, 13 (30 percent) of 44 males and 14 (34 percent) of 41 females were positive.

The data on breed and age were scanty, but there appeared to be a difference in the per-

centage of infections in purebred cats and in cats of mixed breed. This difference may indicate either that ringworm is apt to develop more readily among groups of cats confined in breeding establishments or that purebred cats are more susceptible to ringworm than other types of cats.

The peak months for the occurrence of ringworm among cats were September, October, and November. However, the numbers of cases are too few to admit of any definite conclusions. An analysis of the data according to season showed that 9 (21 percent) of 43 cats cultured in the spring were positive, 38 (37 percent) of 103 cultured in the summer, 67 (71 percent) of 94 cultured in the fall, and 11 (27 percent) of 41 cultured in the winter.

Only 2 (1.6 percent) of the 125 feline cases occurred in rural areas.

Infections in Cattle and Horses

Specimens of hair from 105 cattle were cultured and *T. verrucosum* was isolated from 21 (20 percent). *T. verrucosum* was the only dermatophyte isolated. The 21 cases were from 10 States and represented 14 herds of cattle.

The age distribution of the infected cattle was as follows:

| Age (years) | Number examined | Positive | |
|------------------|-----------------|----------|---------|
| | | Number | Percent |
| 2 and under..... | 45 | 18 | 40 |
| 3-4..... | 23 | 1 | 4 |
| 5-6..... | 20 | 1 | 5 |
| 7 and over..... | 6 | 0 | 0 |
| Unknown..... | 11 | 1 | 9 |

The ringworm cases occurred among both dairy and beef cattle, including Hereford,

Table 4. Age distribution of 281 cats infected with ringworm

| Age (years) | Number examined | Positive | |
|-----------------|-----------------|----------|---------|
| | | Number | Percent |
| Under 1..... | 109 | 73 | 67 |
| 1-2..... | 88 | 28 | 32 |
| 3-4..... | 42 | 16 | 38 |
| 5-6..... | 16 | 3 | 19 |
| 7 and over..... | 17 | 5 | 29 |
| Unknown..... | 9 | 0 | 0 |
| Total..... | 281 | 125 | 45 |

breaks, by infected dogs. The number of individuals involved in any one outbreak varied from 1 to 16; the total number of suspected cases was 107. The outbreaks occurred in 16 States (fig. 2).

Infections in Dogs

Specimens of hair from 641 dogs were cultured; 127 dogs (19.8 percent) had ringworm. *M. canis* was isolated from 77 (12 percent), *M. gypseum* from 46 (7.2 percent) and *T. mentagrophytes* from 4 (0.6 percent). *Keratinomyces ajelloi* was isolated from a 4-year-old male fox terrier from New Jersey with suppurative lesions on its head. *K. ajelloi*, however, has not been proved to be a pathogen.

Thirty-nine percent of the dogs under 1 year of age were positive for ringworm (table 3). This percentage decreased with age; only 1 percent were positive in dogs 7 years of age and over.

There did not appear to be a marked dif-

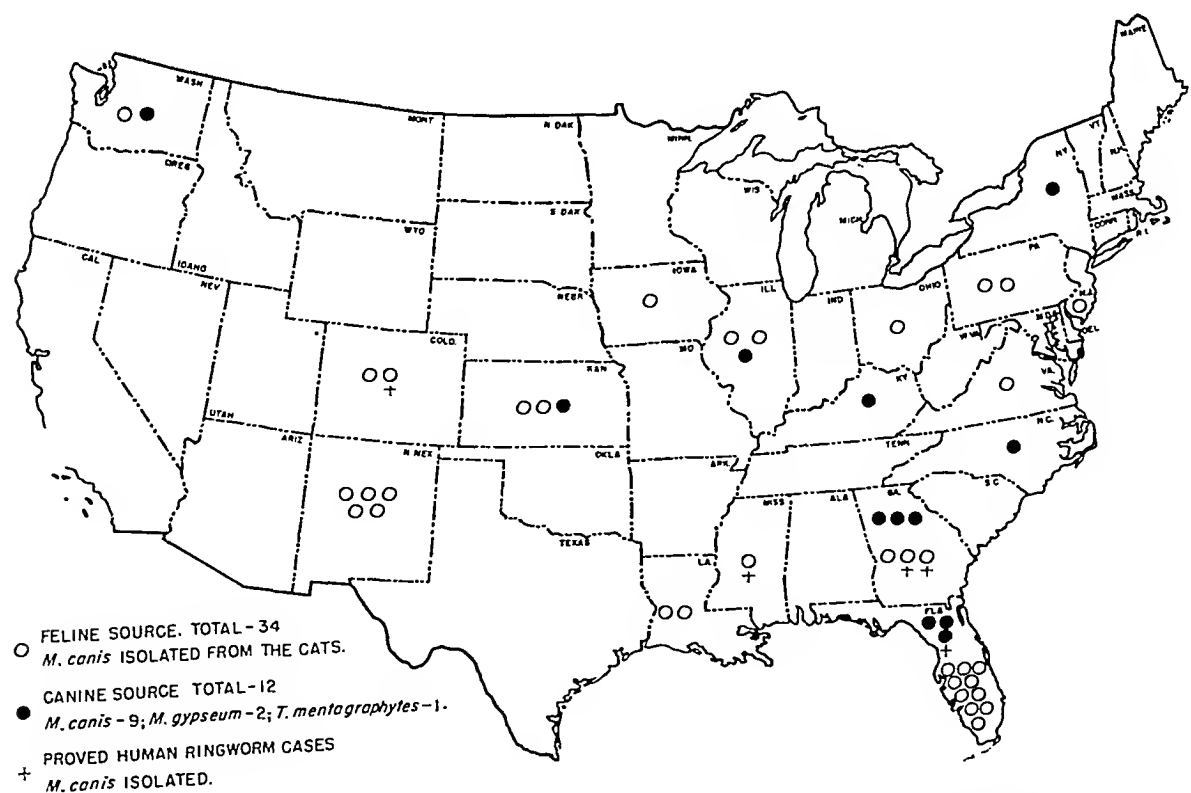
ference in susceptibility between the sexes; 78 (23 percent) of 342 males and 49 (17 percent) of 281 females were positive.

The data on breed group and age were too scanty to determine definite differences in susceptibility to ringworm; however, the data indicated that all breed groups were involved. Breeds were grouped according to the American Kennel Club classification. In the groups aged 1 and 2 years, the percentages positive were quite similar, possibly indicating that the breed of the animal is not an important factor in susceptibility to infection.

Twenty-two (14 percent) of 152 dogs cultured in the spring were positive, 43 (19 percent) of 227 cultured in the summer, 35 (22 percent) of 159 cultured in the fall, and 27 (26 percent) of 103 cultured in the winter. January was the peak month, with 10 (30 percent) of the 33 cultures positive.

Only 14 (11 percent) of the 127 canine cases of ringworm were found in rural areas. Six (7.7 percent) of the *M. canis* cases and 8 (17.3

Figure 2. Distribution of 46 outbreaks of suspected cases of ringworm in man associated with cases of ringworm in dogs and cats, August 1953 to September 1955.



dents. Because of their ubiquity and abundance, rodents would constitute a more likely source of human infection than the occasional infected dog or other farm animal.

Second to *M. canis*, *M. gypseum* appears to be the most common cause of ringworm among dogs in the United States. Verification of 46 cases during the 2-year period of this survey was quite surprising since this type of ringworm had previously been thought to be rare in animals. The recently acquired knowledge that *M. gypseum* is a common soil saprophyte (11), however, suggests that infection should be common in animals. The supposed rarity of *M. gypseum* infections is probably due to the fact that cultures are seldom made from animals suspected of having ringworm.

Summary

In a survey of domestic, captive, and wild animals for ringworm, dermatophytes were isolated from 520 (20 percent) of the 2,538 hair specimens cultured. The organisms commonly isolated were *Microsporum canis* from cats, dogs, monkeys, and a chinchilla; *Microsporum gypseum* from dogs, mice, rats; *Trichophyton mentagrophytes* from dogs, horses, chinchillas, guinea pigs, mice, rats, a kangaroo, and an opossum; and *Trichophyton verrucosum* from cattle and a burro. Data are presented concerning the frequency of skin lesions, method of diagnosis, and the epizootiological aspects of canine and feline ringworm. The results in-

dicade that ringworm is a common disease among animals in the United States.

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National Health Survey Launched

On May 6, 1957, interviewers in the National Health Survey began visiting selected households throughout the Nation to collect information on illness, accidents and injuries, disability, hospitalization, and medical and dental care.

The survey, which will be continuous, was authorized by the 84th Congress. The household interviewing is being done for the Public Health Service by the Bureau of the Census; it represents the first effort in 20 years to collect such facts comprehensively.

The National Health Survey is also planning methodological and special studies to collect data not obtainable through household interviewing.

Aberdeen Angus, Brahman-Hereford cross, Jersey, Guernsey, and Holstein.

The disease occurred among cattle on the range, in feed lots, and on small dairy farms. In some outbreaks, 25 to 50 percent of the animals had skin lesions. The number of isolations reported does not represent the total number of cases of ringworm in the 14 herds.

Although there was no history of human infections among the individuals associated with the infected cattle, such transmission has been reported in the United States (7).

Specimens of hair from 29 horses were cultured and *T. equinum* was isolated from 3 (10 percent): a saddle horse from Florida, a Tennessee walking horse from Ohio, and a thoroughbred horse from New Jersey. A recent study of ringworm of the horse by Georg and co-workers (8), with special reference to *T. equinum*, emphasizes that *T. equinum* is distinct from *T. mentagrophytes*.

Infections in Captive and Wild Animals

The organism most commonly isolated from captive animals was *T. mentagrophytes*. This organism was isolated from 6 chinchillas, 141 guinea pigs, and a kangaroo. *M. canis*, which appeared to be prevalent among monkeys, was isolated from 6 of 8 monkeys from Florida. *M. canis* was also isolated from one chinchilla.

Most of the specimens of hair from wild animals were obtained through a cooperative study on ringworm which was carried on with the Communicable Disease Center's Newton Field Station, Newton, Ga. Only 16 of 1,142 specimens from southern Georgia were from wild animals with skin lesions. The 1,142 specimens of hair were from 21 species of wild animals (table 2). Dermatophytes were isolated from 88 wild animal specimens (7.7 percent) from southern Georgia.

The organisms isolated from wild animals were: *M. gypseum*, *M. gypseum* (red variety), and *T. mentagrophytes*. The "red variety" of *M. gypseum* differed from the typical *M. gypseum* since the macroconidia had thicker walls and the colony developed a deep blood-red pigment in the agar. The red variety of *M. gypseum* was frequently isolated from cotton rats and field mice.

Discussion

Cats and dogs appear to be important transmitters of ringworm infection to man. Cattle are also of significance in this respect; however no evidence of human contagion from this source was found in this survey. A recent report by Torres and co-workers indicates that chickens may transmit ringworm infection (9).

M. canis was most commonly transmitted to man by cats or dogs. The young kitten with ringworm lesions was suspected of being the most frequent source of human outbreaks. Since there is no evidence that *M. canis* exists as a saprophyte in nature, it would appear that control of *M. canis* ringworm infections in the cat and dog would prevent *M. canis* infection in man. To accomplish this, at least two measures would be needed: (a) the control of breeding establishments and (b) the elimination of stray dogs and cats. Such a program has been developed by La Touche in Leeds, England, and has met with notable success (10).

The three cases of equine ringworm diagnosed in this survey were caused by *T. equinum*. This fungus is of particular interest, for hitherto it has not been recognized as a distinct species in this country. A study of equine ringworm by Georg and co-workers (8) has established that this organism, commonly associated with the horse, is a distinct species and should not be considered to be merely a variety of *T. mentagrophytes*.

The survey of wild animals revealed that ringworm caused by *T. mentagrophytes* is apparently common among rodents. It is interesting that these animals harbor this fungus without demonstrating any clinical signs of infection. The fact that the greatest number of infections occurred among rats which frequented barns and farm premises suggests that these animals may be a source of *T. mentagrophytes* infections in human populations in rural areas. It would not appear to be necessary for human beings to have direct contact with rats in order to acquire infection since it has been found that dermatophytes on hairs or skin scales may remain viable for many months. It is probable that certain areas of farm premises, especially feed bins and barns, may be contaminated by spores and infected hairs shed by ro-

RIO GRANDE VALLEY OF TEXAS IN 1954

Louis, and since then sporadic cases and small outbreaks have been recognized, particularly in California. Subsequent to this study, there have been large outbreaks in the lower Ohio River Valley, 1955, and in the Texas Panhandle and the Louisville, Ky., areas, 1956.

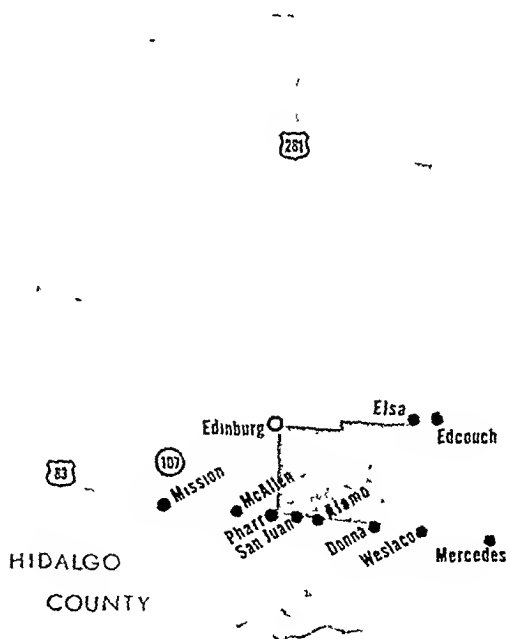
Reporting of this disease, however, is never sufficient except during recognized outbreaks, and even then few cases with adequate followup are described. As a result, the true scope of incidence and geographic distribution has never been defined and the range and severity are inadequately known.

This disease represents only one segment of the larger human disease category of acute infectious encephalitis. The two other distinct viruses indigenous to the United States are western equine and eastern equine encephalitis. Essentially the same limitations exist in the accumulated knowledge pertaining to each. Until there is better understanding of the basic ecol-

ogy of the viral encephalitides, the full extent of the public health problem cannot be known. But it is known that the viruses are transmitted to a reservoir of wild birds by mosquitoes, with a vector occasionally making man and the other larger mammals accidental hosts. Present knowledge indicates that control of encephalitis rests primarily with the control of the particular vector mosquito species.

The outbreak described here occurred late in 1954 in a semitropical area of Texas where the climate and topography especially favor mosquito production. In the spring of that year unusually heavy rains created large residual pools of water that stood for varying periods of time. Hidalgo County and the surrounding area bore the burden of the grave mosquito breeding problem that followed. The Governor declared a state of emergency in this county, and intensive mosquito control operations were conducted. By early May it appeared that adult mosquito populations had been reduced to negligible levels.


In late August an unusually large number of cases of poliomyelitis were reported from the area, many involving adults. This unusual seasonal incidence and the atypical age distribution cast doubt as to the true etiology of the illness. An intensive investigation followed, and St. Louis encephalitis was identified.



AN OUTBREAK OF St. Louis Encephalitis



IN THE LOWER



THE intensive study of an outbreak of St. Louis encephalitis in the Lower Rio Grande Valley of Texas in 1954 is covered comprehensively in the four papers that follow. They present the epidemiological aspects of the outbreak, the clinical and pathological features, the laboratory phases of the work, and the entomological studies and vector control operations.

The outbreak is one of the largest that has been recorded for this viral disease and represents a new geographic area of distribution.

The study was a joint undertaking of the Hidalgo County (Tex.) Health Unit, the Texas State Department of Health, and the Communicable Disease Center of the Public Health Service. At the time of the study, Dr. Theodore J. Bauer, now deputy chief, Bureau of State Services, Public Health Service, was chief of the Communicable Disease Center. Dr. Henry A. Holle was commissioner of health of the Texas State Department of Health, and Dr. Charles H. Miller, Jr., the director of the Hidalgo County Health Unit (now director,

Comanche County Health Department, Oklahoma).

According to Drs. Bauer, Holle, and Miller, the study helped establish *Culex quinquefasciatus* as the natural vector of the St. Louis encephalitis virus. It also gave recognition, probably for the first time, to the prevalence and probable importance of mild and inapparent infections.

In reviewing other outbreaks of the illness, they point out that this virus disease has been recognized a relatively short time. In 1932 an outbreak of an obscure illness in Paris, Ill., and a similar, more extensive outbreak the next year in the St. Louis, Mo., area prompted an intensive investigation. As a result of this study, the disease entity, now known as St. Louis encephalitis, was defined and the etiological agent identified. Though transmission by mosquitoes was suspected, it was ruled out at that time. Retrospective studies, however, have led to acceptance of *Culex pipiens-quinquefasciatus* as the transmitting agent in this epidemic.

Again in 1937 an outbreak occurred in St.

cent urban, 23 percent rural nonfarm, and 20 percent rural farm. Local sources state that the population was approximately 69 percent Latin-American, 30 percent Anglo-American, and less than 0.4 percent Negro. The population increased 51.3 percent from 1940 to 1950. The 1954 population of Hidalgo County was estimated to be 193,369.

Meteorological Data

During the period April 8-14, 1954, heavy rains averaging 10 inches fell over a large area within the county, exceeding by 6 inches the maximum rainfall recorded for the same month during the period 1940 through 1953. Because of poor drainage in this area, the water persisted for quite some time and provided excellent mosquito breeding conditions. The mosquito population, however, was kept down by vector control operations. Precipitation in June, July, August, and September was within normal limits.

Temperatures during the spring were normal, averaging about 75° F. June was the hottest month on record for the period 1940-54; the average temperature was 87.8° F. From July through September the temperatures were within the normal range.

Investigation Methods

The investigation was a joint operation of the Hidalgo County Health Unit, the Texas State Department of Health, and the Public Health Service. On August 27, shortly after the arrival of the epidemiological team, a preliminary appraisal of the epidemic situation was accomplished through a telephone survey to local physicians. This definitely established the existence of an unusual prevalence of a disease resembling virus encephalitis. After this preliminary survey, forms for systematic collection of clinical and epidemiological data were prepared. A meeting was then held with the representatives of the local medical society for the purpose of obtaining cooperation in the prompt and accurate reporting of cases. Physicians were also encouraged to submit a list of patients that they had previously seen and suspected of having had encephalitis, and to obtain blood

specimens from all new patients during the acute phase of the illness. Investigators visited these physicians periodically in order to collect data on new cases. They also visited local hospitals and patients at home during convalescence to obtain more complete epidemiological data.

Only one hospital in this area was available for treatment of poliomyelitis, and all cases diagnosed as having poliomyelitis were admitted there. Owing to the difficulty of differentiating nonparalytic poliomyelitis from encephalitis clinically, one epidemiologist was assigned to this hospital to study the cases admitted and to review the hospital records. Many of the cases admitted there during this epidemic period were subsequently found to have encephalitis rather than poliomyelitis.

Paired serum samples from 87 patients and single serums from 50 individuals giving a history of no illness were collected for antibody determination. Three autopsies were performed, and brain tissues from two were taken for virus study. All specimens were sent to the bureau of laboratories of the Texas State Department of Health. In addition, brain tissues were sent to the Virus and Rickettsia Section, Communicable Disease Center, for virus isolation.

In a diligent search for potential vectors, the entomologists emphasized collection of adult mosquitoes for virus isolation.

Local veterinarians were also contacted to ascertain whether there were any known outbreaks of disease in animals, and any notifications of unusual disease in animals were investigated by the veterinarian epidemiologist.

Results

In general, the disease was an acute febrile illness characterized by a relatively abrupt onset, with fever, severe generalized headache, malaise, disorientation, stupor, and signs of meningeal irritation. The course was usually self-limited, with the fever lasting 3 to 7 days, falling by lysis.

During early July physicians began to notice an increase in the number of patients with fever of unknown origin. In retrospect, these cases could have been mild encephalitis and probably represented the beginning of the epi-

Epidemiological Features

TOM D. Y. CHIN, M.D., C. ROGER HEIMLICH, M.A., RICHARD F. WHITE, M.D.,
DONALD M. MASON, D.V.M., and MICHAEL E. FURCOLOW, M.D.

DURING the late summer of 1954, an outbreak of illness subsequently identified as St. Louis encephalitis occurred in the Lower Rio Grande Valley of Texas.

The existence of a viral encephalitis in epidemic form was first suspected by the local health authorities in the latter part of August, when an unusually large number of cases of poliomyelitis were reported from Hidalgo County. It was noted that a large proportion of the cases were in adults. In view of this unusual seasonal incidence, together with the atypical age distribution, a disease entity other than poliomyelitis was suspected.

On August 24 a request for epidemiological aid was submitted to the Communicable Disease Center of the Public Health Service by the Texas State Department of Health. A CDC team consisting of epidemiologists, entomologists, and a statistician was sent to the scene of the epidemic to aid in the investigation. Records on 373 cases, 10 of them fatal, were obtained from Hidalgo and adjoining counties.

Hidalgo County is in the Lower Rio Grande Valley of Texas (see map, p. 511). The economy of the area is based upon agriculture carried on in the irrigated, highly fertile, southern part of the county bordering the Rio Grande

River. Citrus, cotton, and truck produce are the primary crops. Canning and oil and gas production are also important industries. The northern part of the county is sparsely settled *ranch country and contains only a small portion of the population.*

The residents of the area may be divided into two major ethnic groups, namely, Latin-American and Anglo-American. The Latin-Americans are of Mexican and Spanish descent, while the term Anglo-American applies to the remainder of the population with the exception of small Negroid and Asiatic components. The Latin-Americans are largely unskilled and semiskilled laborers, often employed only during periods of agricultural labor demand. In many instances their housing is inadequate and crowded, and sanitation is poor. The two groups generally live in separate sections of the urban communities.

There are also a number of Mexican nationals, engaged primarily in agricultural labor, living in the valley. These include the *braceros*, laborers who enter the country under Government supervision, and many "wetbacks" who have entered the country illegally in search of higher wages. The *braceros* live in closely supervised camps and remain in this country only for a specified period as dictated by agricultural need and labor contract provisions. The "wetbacks" often are semipermanent residents of the area, their periods of tenure being limited only by detection and deportation by the border patrol. They live in whatever housing they can find, usually under extremely primitive and crowded conditions.

The population of the county, according to the 1950 decennial census, was 160,446; 57 per-

Dr. Furcolow is chief and Dr. Chin is assistant chief of the Kansas City Field Station, Communicable Disease Center, Public Health Service. Dr. Mason, a CDC veterinarian, is now assigned to the George William Hooper Foundation, San Francisco, Calif. Mr. Heimlich and Dr. White, with CDC at the time of this study, are now, respectively, with a private firm in Columbus, Ind., and with the Sonoma County Hospital, Calif.

Table 2. Number of cases and attack rates by age and sex for 317 residents of Hidalgo County, Tex., late summer 1954

| Age | Estimated 1954 population | | | Number of cases | | | Attack rate per 100,000 | | |
|------------------|---------------------------|--------|---------|-----------------|--------|-------|-------------------------|--------|-------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Under 9..... | 27,268 | 26,437 | 53,705 | 37 | 17 | 54 | 135.7 | 64.3 | 100.5 |
| 10-19..... | 18,484 | 17,593 | 36,077 | 20 | 21 | 41 | 108.2 | 119.4 | 113.6 |
| 20-29..... | 17,614 | 16,762 | 34,376 | 18 | 20 | 38 | 102.2 | 119.3 | 110.5 |
| 30-39..... | 13,182 | 11,992 | 25,174 | 17 | 29 | 46 | 129.0 | 241.8 | 182.7 |
| 40-49..... | 10,348 | 9,050 | 19,398 | 6 | 20 | 26 | 58.0 | 221.0 | 134.0 |
| 50-59..... | 6,202 | 5,889 | 12,091 | 16 | 11 | 27 | 258.0 | 186.8 | 223.3 |
| 60-69..... | 3,960 | 3,812 | 7,772 | 13 | 20 | 33 | 328.3 | 524.6 | 424.6 |
| 70 and over..... | 2,478 | 2,298 | 4,776 | 13 | 14 | 27 | 524.6 | 609.2 | 565.3 |
| Unknown..... | | | | 15 | 10 | 25 | | | |
| Total..... | 99,536 | 93,833 | 193,369 | 155 | 162 | 317 | 155.7 | 172.6 | 163.9 |

and for females, 172.6. In the 0- to 9-year age group, the attack rate in males, 135.7, was roughly twice that of 64.3 for females; in the 40- to 49-year age group only 6 cases were reported in males, giving an attack rate of 58 as compared with 221 for females.

The rate for the Anglo-American population was more than three times that for the Latin-American (table 3). It is quite possible that some of the cases included in the Latin-American group were actually Mexican nationals. This, if true, would tend to strengthen the observed difference. On the other hand, it is quite certain that reporting was less accurate among the Latin-Americans than among the Anglo-Americans, and this would tend to diminish the observed difference in the incidence. The attack rate for the *braceros*, based on a very rough population estimate, appeared about midway between the two racial groups. It may also be stated that *braceros* were covered by compulsory medical insurance and generally were hospitalized. This resulted in more accurate reporting than might have been expected in this group.

The rural-urban distribution of the reported cases in Hidalgo County showed a higher attack rate in the urban population than in the rural (table 4).

For entomological studies, approximately 2,000 adult mosquitoes were collected by light traps, hand collections in shelters, and biting collections. Representative samples of larvae were collected from temporary and permanent water. It was found that *Psorophora confinnis* was predominant in the temporary water habi-

tats. However, in artificial containers around premises, *Culex quinquefasciatus* was found breeding in significant numbers. This species was predominant among mosquitoes collected in shelters; it formed a large percentage of those obtained from biting collections, and about 14 percent of the mosquitoes collected by light traps. *P. confinnis* was the preponderant species among those caught by the latter method.

The virus of St. Louis encephalitis was isolated from brain tissues of one fatal case of encephalitis as well as from two pools of *C. quinquefasciatus* mosquitoes. A fourfold or greater rise of complement-fixing antibodies for St. Louis encephalitis was demonstrated on 43.7 percent of the patients. Seventy percent of the individuals who presumably were exposed but had no clinical illness also had complement-fixing antibodies for this disease.

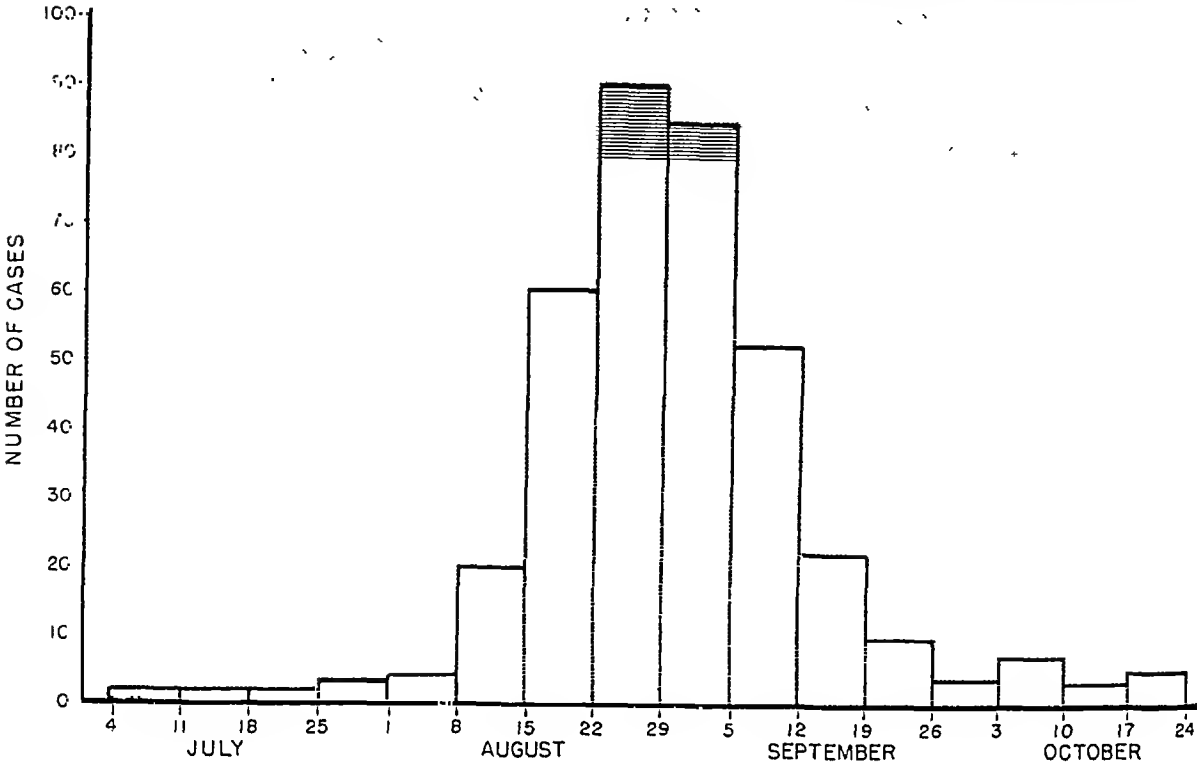
No detailed studies on possible reservoirs of infection were made in animals during this epi-

Table 3. Number of cases and attack rates by ethnic group, Hidalgo County, Tex., 1954

| Ethnic group | Estimated 1954 population | Number of cases | Rate per 100,000 |
|----------------------|---------------------------|-----------------|------------------|
| Anglo-American..... | 59,944 | 191 | 318.4 |
| Latin-American..... | 133,424 | 126 | 94.4 |
| <i>Bracero</i> | 12,000 | 23 | 191.7 |
| Other..... | | 1 | |
| Unknown..... | | 2 | |

¹ Estimated number of *braceros* in the county during the outbreak.

Figure 1. Distribution of 363 reported cases by week of onset, Hidalgo County, Tex., 1954.



demic. In August an increasing number of cases were observed, and the outbreak reached its peak during the last week of the month. Figure 1 depicts the epidemic curve of the 363 cases for which date of onset was available. The dates of onset of the other 10 cases were not recorded. It is of interest that most of the cases occurred during the period from the middle of August to the middle of September.

Based on the 317 cases for which data were available and on the estimated 1954 population, the attack rate for Hidalgo County was 163.9 per 100,000. It was felt that many patients with symptoms of mild encephalitis were not seen by physicians and consequently had not been reported. Further, during the early phase of the epidemic many of the cases diagnosed as encephalitis were not reported to the health department. Based on the number obtained by the telephone survey and on the number of cases actually reported, it was estimated that approximately 2.8 times as many cases had occurred as were actually reported, or a total of approximately 1,000 cases.

Of 11 towns in this area with a population

greater than 1,000, the attack rate was highest in Weslaco and lowest in Mercedes (table 1). The cases occurred in widely separated areas and there was no evidence of radial spread from one town to another. Although all age groups were affected, the incidence was highest in individuals over 50 years of age (table 2). The incidence for males was 155.7 per 100,000

Table 1. Number of cases and attack rates for cities with more than 1,000 population, Hidalgo County, Tex., 1954

| City | Estimated 1954 population | Number of cases | Rate per 100,000 |
|---------------|---------------------------|-----------------|------------------|
| Weslaco..... | 9, 056 | 39 | 430. 6 |
| San Juan..... | 4, 113 | 12 | 291. 8 |
| Edinburg..... | 14, 924 | 37 | 247. 9 |
| Edcouch..... | 3, 525 | 6 | 170. 2 |
| Alamo..... | 3, 636 | 7 | 192. 5 |
| Elsa..... | 3, 831 | 7 | 182. 7 |
| McAllen..... | 24, 185 | 44 | 181. 9 |
| Pharr..... | 10, 473 | 17 | 162. 3 |
| Mission..... | 12, 974 | 17 | 131. 0 |
| Donna..... | 8, 642 | 7 | 81. 0 |
| Mercedes..... | 12, 150 | 3 | 24. 7 |

cases occurring during the late summer and early fall, and the age distribution, with the majority of the cases occurring in the older age groups, were strikingly similar. The attack rate for Hidalgo County, however, was higher than that in the St. Louis outbreak, with 163.9 per 100,000 as compared with 99 per 100,000. In comparing the age distribution with that of the St. Louis outbreak in 1933 (fig. 2), it is evident that the two curves are almost identical except that the attack rate in Hidalgo County was greater in each age decade than that in the St. Louis outbreak. In both places, however, the rate increased abruptly after the age of 50.

Further, in the St. Louis epidemic the attack rate was higher in those living in the suburbs of the city. In Hidalgo County a higher rate was observed in the urban population. It should be pointed out, however, that the urban areas of Hidalgo County are more similar to the suburban St. Louis County than to the highly metropolitan city of St. Louis. Also, the areas in Hidalgo County do not lend themselves to a sharp rural-urban distinction, since farm animals, pit privies, and other typically rural characteristics, such as irrigation ditches, weed-covered areas, and standing bodies of water, are often encountered within the city limits. The reporting might also have been more accurate within the cities.

A remarkable feature of this outbreak is the low death rate. Only 10 deaths were attributed to encephalitis, which gives a case fatality of less than 2 percent, while in the St. Louis epidemic the rate was approximately 20 percent.

In the St. Louis outbreak the epidemic began in the rural region of St. Louis County and spread toward and into the city; there was no evidence that the disease had a similar spread in Hidalgo County. Multiple cases in families were uncommon, and there was no evidence that spread was by contact. Further, there was no indication that the disease was spread through a common source medium such as water, milk, or other foods.

Mosquitoes are believed to be important vectors in the transmission of St. Louis encephalitis. Five species of mosquitoes, *Culex tarsalis*, *Culex pipiens*, *C. quinquefasciatus*, *Culex stigmatosoma*, and *Aedes dorsalis* have been found infected with the St. Louis virus in nature (4).

In the laboratory, the virus has been successfully transmitted to animals by *C. quinquefasciatus*, and by 11 other species from 3 genera, *Culex*, *Aedes*, and *Culiseta* (5). In view of the fact that *C. quinquefasciatus* was the predominant species collected in shelters and from biting collections, together with the isolation of the St. Louis virus from two of the pools, the evidence to incriminate this mosquito as the most probable vector in the Hidalgo outbreak is certainly strong.

There was no evidence that more than one virus was associated with the present epidemic, although the occurrence of western equine, eastern equine, and St. Louis encephalitis viruses in the Lower Rio Grande Valley had been previously recognized (6). On epidemiological grounds alone, the Hidalgo outbreak was St. Louis encephalitis. In the 1952 outbreak of encephalitis in California, as in the previous years, western equine was predominant in June and July, while St. Louis encephalitis reached its peak in September (10-12). In Hidalgo County, no cases were reported in June and very few in July; most of the cases occurred in late August and early September. Approximately one-third of the cases of western equine in California were in patients less than 1 year of age, whereas in Hidalgo County most of the patients were in the older age groups. Eastern equine encephalitis may be readily excluded on the basis of greater severity and marked age selection involving children primarily. Serologic evidence and absence of epizootics lend further support to this epidemiological reasoning.

Summary

In an epidemiological study of the encephalitis outbreak occurring during the late summer of 1954 in the Lower Rio Grande Valley, records of 373 reported cases were collected. However, it was estimated that somewhat over 1,000 cases had occurred during the epidemic.

The epidemiological features of the present outbreak resemble, in many respects, those of the 1933 St. Louis epidemic, particularly in regard to the seasonal incidence and the age distribution.

There were only 10 deaths, or a case fatality

Table 4. Number of cases and attack rates by rural-urban classification, Hidalgo County, Tex., 1954

| Classification | Estimated 1954 population | Number of cases | Rate per 100,000 |
|----------------------|---------------------------|-----------------|------------------|
| Urban residents----- | 110,800 | 191 | 178.7 |
| Rural residents----- | 96,569 | 114 | 110.2 |
| Unknown----- | | 31 | |

demic. However, preliminary investigation showed no known epizootics occurring concurrently with the epidemic or during the spring and summer.

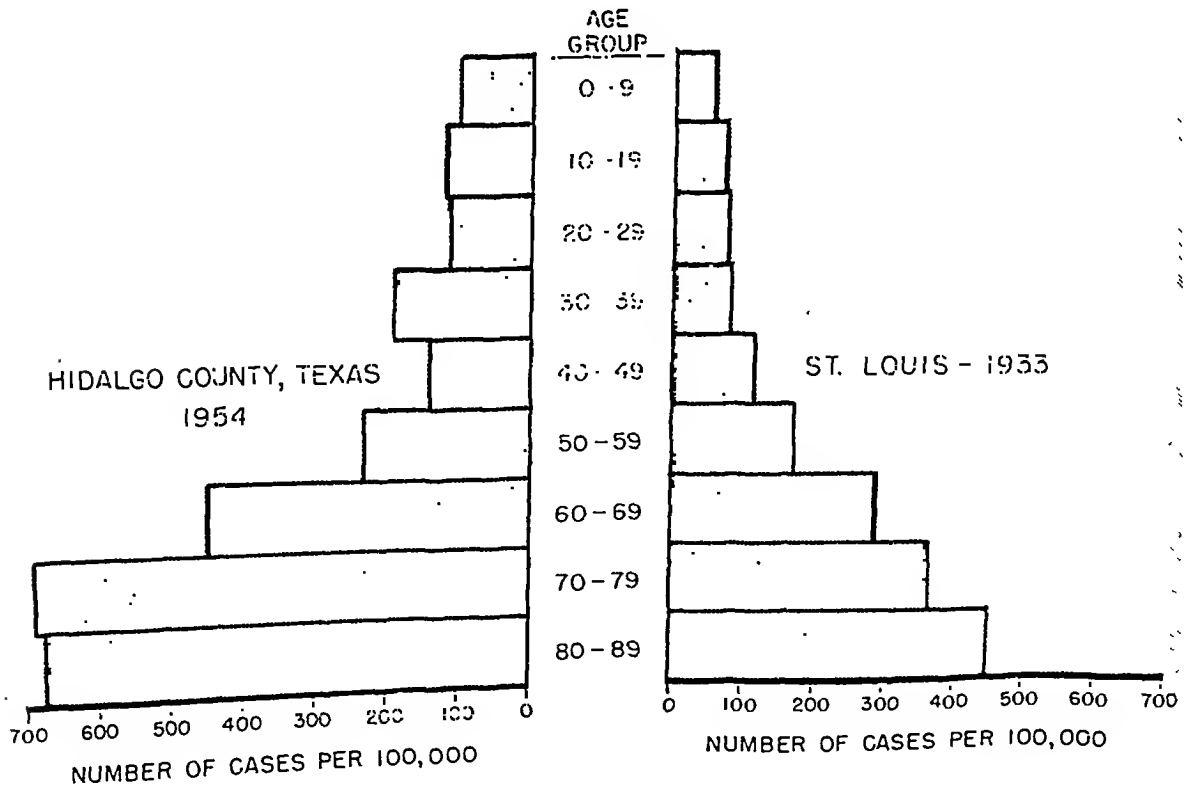
Discussion

Based on the epidemiological picture and the laboratory findings, the epidemic appeared to be St. Louis encephalitis. The disease was first encountered in epidemic form in Paris, Ill., in 1932. At that time it was

regarded as Von Economo's disease (1). During the following summer a similar epidemic occurred in and around St. Louis, with smaller foci in Kansas City, St. Joseph, and Columbia, Mo., and to some extent in the States of Illinois and Kentucky. A total of 1,095 cases were reported in the city and county of St. Louis. This epidemic was thoroughly investigated, and the virus of St. Louis encephalitis was isolated by inoculation of infected human brain tissue into monkeys (2). In 1937 an epidemic occurred in the St. Louis area, with 518 cases reported (3). Since then small outbreaks and sporadic cases have been reported from various areas, particularly in California and Kansas. And subsequent to this study there were important outbreaks in the lower Ohio Valley in 1955 and in the Texas Panhandle and the Louisville, Ky., areas in 1956.

The epidemiological features and the clinical picture of the present outbreak resemble, in many respects, those of the 1933 St. Louis outbreak. The seasonal incidence, with most of the

Figure 2. Comparison of attack rates by age, Hidalgo County outbreak and St. Louis outbreak of encephalitis.



Training Public Health Workers in 1956

More than 17,000 persons received training provided by the Bureau of State Services, Public Health Service, in the fiscal year 1956. Of these, more than 8,000 (46 percent) were from State and local health departments. Almost 4,000 (22 percent) were faculty members and students from universities and students from foreign countries. Nearly 1,500 (8 percent) were in health-related work in industry. Length of training ranged from a 1-hour lecture for university students to 9 months at a university for foreign students. Most of the courses, however, were of 1 to 2 weeks' duration.

The number of courses, as well as trainees, has increased steadily in the past 5 to 10 years. During the fiscal year 1956, the Bureau of State Services offered or participated in courses covering 90 different subjects.

Enrollment for the Communicable Disease Center courses in Atlanta rose from 89 in 1947 to more than 1,190 in 1955. In the Center's field courses, attendance increased from 183 in 1947 to more than 4,600 in 1956.

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of less than 2 percent of the estimated number of cases. Autopsies were performed on 3 of the patients who died, and brain tissue specimens were taken from 2. The virus of St. Louis encephalitis was isolated from 1 of these 2.

Culex quinquefasciatus was the most prevalent species of mosquitoes observed, and the St. Louis virus was isolated from two pools of these mosquitoes.

On the basis of the epidemiological picture, together with the confirmatory laboratory support, it was concluded that the outbreak was due primarily to the St. Louis virus.

Clinical and Pathological Features

CALVIN M. KUNIN, M.D., and TOM D. Y. CHIN, M.D.

CLINICAL data on the 1954 outbreak of encephalitis in Texas were obtained from the 373 cases investigated by the epidemiological team, as well as from the series of 20 cases studied more extensively by Kunin and a retrospective study of 10 known fatal cases. Findings from three autopsies also were used.

Isolation of St. Louis encephalitis virus from the brain of a fatal case and from two pools of *Culex quinquefasciatus* mosquitoes, as well as confirmatory serologic evidence, led to the conclusion that Hidalgo County was experiencing an outbreak of St. Louis encephalitis, probably the largest since the St. Louis epidemic of 1933 (1).

Study Methods

Early in the investigation of this epidemic it became obvious that a careful clinical evaluation of the encephalitic syndrome was imperative, but it was necessary to limit the study because of the shortage of qualified investigators. A group of hospitalized patients considered fairly representative of the more seriously ill was selected. In addition, home visits were made for followup of these patients and to investigate those whose illness was less severe.

Selection of the group chosen for intensive study was based on availability of data regard-

ing pre-encephalitic illness, hospital course, temperature curve, and cerebrospinal fluid, and data from hemogram and other studies. To facilitate communication and followup, Anglo-Americans (as differentiated from Latin-Americans) were selected, as far as possible.

The patients were visited during varying phases of their illness, usually during the acute stage and again 5 to 6 weeks later. Each was given a general physical examination, and a detailed neurological examination with special attention paid to mental status. Discussions were held with a number of key physicians in the area, who together had personally seen more than 300 cases. Their clinical impressions were essentially identical.

In the main, data from 373 epidemiological forms were obtained by lay investigators seeking information at offices of busy local physicians. Cases were accepted as encephalitis if they had been diagnosed as such by the physicians, and no attempt was made to subject these diagnoses to critical scrutiny. The data from these forms were reviewed with this in mind.

An acute and a convalescent blood specimen was drawn on each patient and sent to the bureau of laboratories, Texas State Department of Health. Of the 20 individuals who were subjected to particularly careful investigation, there was serologic information on 12. For 11 of these, a fourfold or greater rise in complement fixing antibody titer to St. Louis encephalitis was demonstrated by the Texas laboratory. A few of these were studied at the Virus and Rickettsia Laboratory, Communicable Disease Center, Montgomery, Ala., with essentially identical findings. The virus of St. Louis encephalitis was isolated from the brain of a fatal case.

Dr. Kunin was formerly with the Communicable Disease Center of the Public Health Service, on assignment to the University of Michigan School of Public Health, Ann Arbor. He is now assistant resident physician at Peter Bent Brigham Hospital, Boston, Mass. Dr. Chin is assistant chief of the Kansas City Field Station, Kans., Communicable Disease Center.

Results

The disease in the Lower Rio Grande Valley, colloquially termed "sleeping sickness," was an acute febrile illness characterized by severe headache, fever, and stupor, with signs of meningeal irritation. The course was self-limited and left few aftereffects. The morbidity was high, particularly in older age groups, but no age was spared. There were 10 deaths attributed to encephalitis. The sex distribution showed a slight preponderance of females.

Characteristically, the onset was relatively abrupt, with fever, severe generalized headache, malaise, nausea, and vomiting. Encephalitic symptoms, predominantly disorientation, irritability, and stupor, began during the first or second day of illness and persisted somewhat longer than the fever. In the more severe cases the delirious state lasted for many weeks.

Data on the relative frequency of the acute complaints show that among 342 cases, 94 per-

cent had fever, 84 percent had headache, and 61 percent, stiff neck. Forty-seven percent experienced vomiting, 46 percent nausea, and 46 percent, muscle pain. Muscle weakness, usually of a generalized nature, was reported in 32 percent of the cases and frequently persisted for many weeks. Twenty-five percent complained of sore throat, 16 percent of constipation, and 12 percent of diarrhea. The distribution of complaints was generally the same for all ages.

On examination, the patients appeared acutely ill; nuchal rigidity and positive Kernig and Brudzinski signs were frequently demonstrated. The diagnosis was often confused with anterior poliomyelitis, in which muscle tenderness and increased resistance to passive motion in the back and hamstrings are also frequently observed. The general physical examination did not reveal any abnormalities in other organ systems.

Most profoundly disturbed were the highly integrated functions of the cerebral cortex.

Summary of clinical data for 10 fatal cases of encephalitis in the Lower Rio Grande Valley, Tex.

| Patient | Age | Sex | Ethnic group | Days ill | Maximum temperature | Cerebrospinal fluid | | White blood count per cu. mm. | Underlying condition |
|-----------------------|--------|-----|----------------|----------|---------------------|---------------------|-----------------------|-------------------------------|--|
| | | | | | | Cells | Protein (mg. percent) | | |
| R. A ¹ --- | 58 | M | Anglo-American | 5½ | 107° F--- | ² 1,054 | 179 | 13,950 | Hypertension, arteriosclerosis, hepatic cirrhosis. |
| A. H.--- | 68 | F | do----- | 9 | 105° F--- | ² 47 | 144 | 10,600 | Asthma, bronchitis. Head injury in auto accident 1 year prior to death. |
| C. H.--- | 68 | F | do----- | 18 | 101.6° F--- | ² 647 | 99 | 19,600 | |
| A. M.--- | 60 | F | Latin-American | 7 | 105° F--- | ³ 183 | 76 | 8,500 | 2-week diarrhea. |
| R. M.--- | 89 | F | Anglo-American | 4 | 104° F--- | ----- | ----- | 10,000 | Arthritis (senile). |
| M. H.--- | 83 | F | do----- | 8 | 102° F--- | ----- | ----- | 6,100 | Hypertension, azotemia, arteriosclerosis, on digitalis, terminal pneumonia. |
| P. C.--- | 43 | F | Latin-American | 17 | 102.5° F--- | ² 37 | (⁴) | 4,800 | None. |
| L. L.--- | 80 | F | Anglo-American | 7 | 103.4° F--- | ----- | ----- | 10,800 | Congestive heart failure, arteriosclerotic heart disease, bronchopneumonia. |
| M. P.--- | 9 | M | do----- | 4 | 103° F--- | ⁵ 150 | 50 | 9,000 | None. |
| E. E.--- | 9 mos. | F | Latin-American | 3 | Febrile | ² 52 | ----- | 18,600 | Mother had pulmonary TB and in contact with child during and prior to illness. |

¹ St. Louis virus isolated.

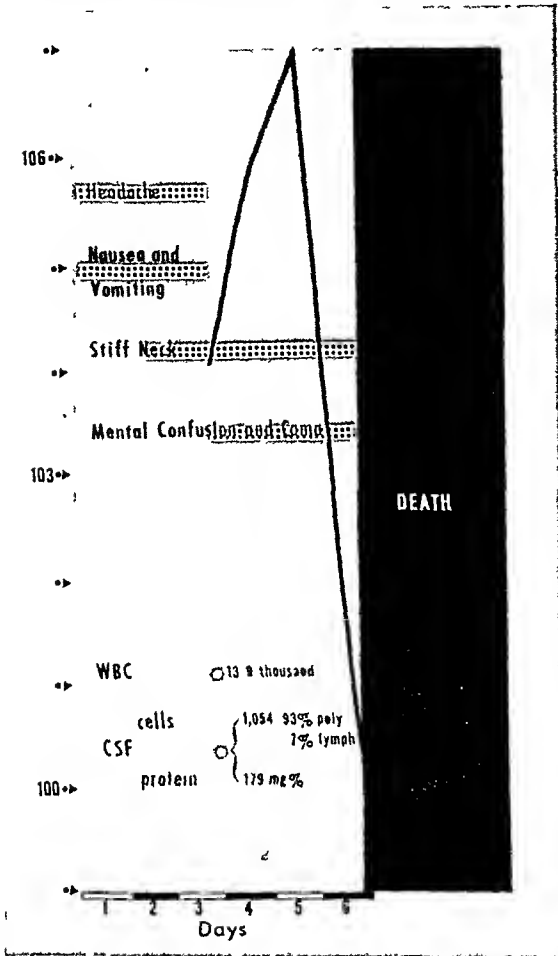
² Mostly polymorphonuclear.

³ Equal number of polymorphonuclear leukocytes and lymphocytes.

⁴ Pandy test negative.

⁵ Mostly lymphocytes.

Figure 1. The course of a fatal case from which St. Louis encephalitis virus was isolated.



This took the form of disorientation, stupor, and coma. At the onset of the encephalitis course, many of the more severely ill patients were agitated and difficult to manage. Within a few days the effect became bland, faces expressionless but not rigid. A number of these patients demonstrated poor general knowledge, defects in recall of recent events, and poor orientation to time, place, and person. There was no evidence of specific cerebellar damage, no muscular rigidity or nystagmus. The gait was unsteady, but the Romberg test was negative. There were no reports of oculogyric crises, Parkinsonism, or athetosis. Paralysis was rarely seen and no sensory changes could be detected. Frequently during the acute illness and persisting for at least a number of weeks during convalescence, a fine intention

tremor of both hands could be demonstrated. There was no wasting nor were there any trophic changes.

The febrile course usually persisted for 3 to 7 days and generally cleared by lysis, with the maximum temperature usually reached by the second to third day. Temperature data on 260 patients indicate that more than half had a maximum of 103° F., while about 10 percent had a temperature over 105° F. A few of the more seriously ill patients, usually in the older age group, had a more prolonged illness, with a low-grade fever persisting 2 to 3 weeks. The younger patients generally had higher temperatures with shorter courses.

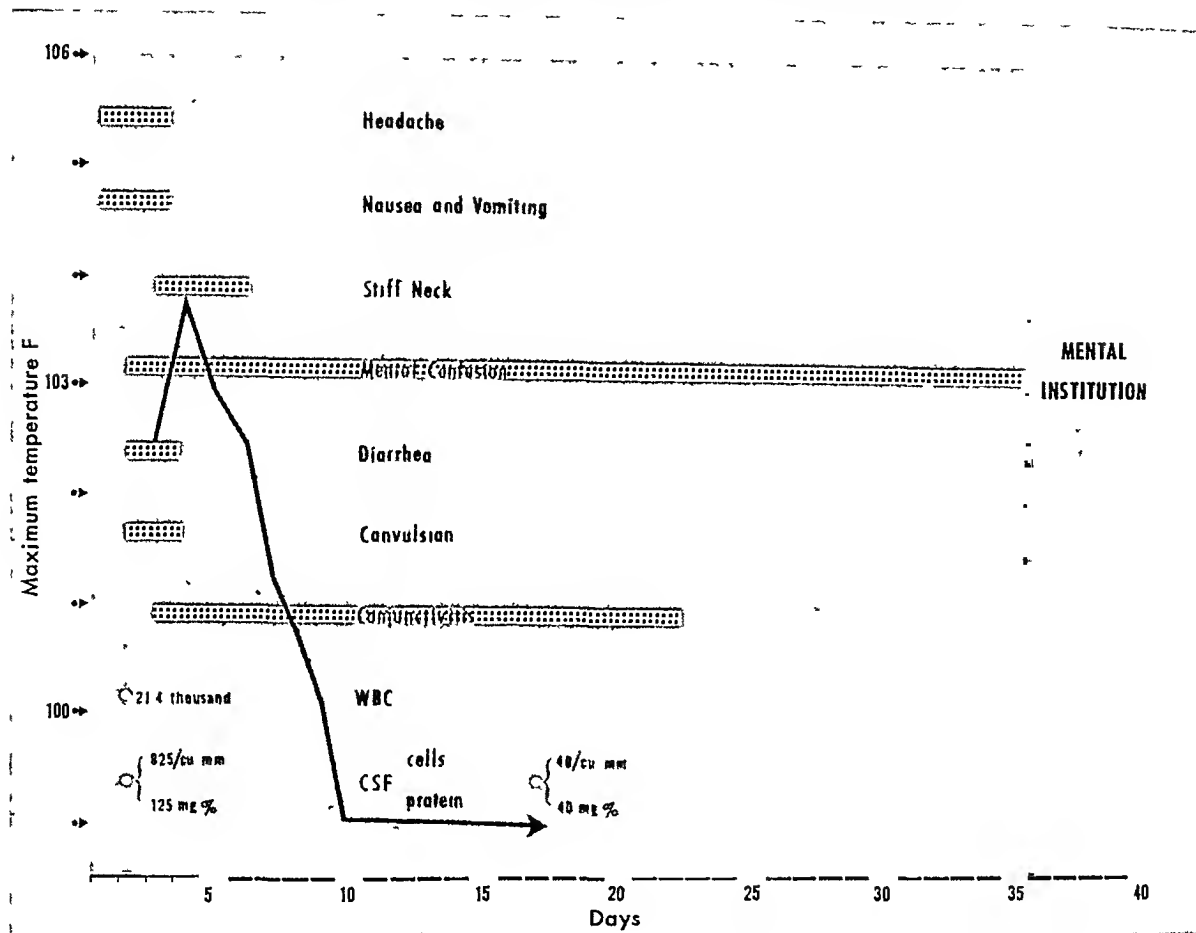
Convulsions occurred in the more severely ill patients, in most cases after the fever had begun to lyse. They were described as generalized and were seen in all age groups. A few infants demonstrated grand mal convulsions at the onset of illness when maximally febrile. In adults and older children with convulsions, the disease was more prolonged, the neurological damage was more pronounced, and the residual effects were more persistent. One patient (B. S.) apparently suffered irreversible brain damage and was placed in a mental institution. The others had surprisingly little aftereffects.

In most cases the course was fairly benign. Many had only a brief febrile illness with headache which lasted a few days. Upon recovery, the patient suffered no apparent aftereffects. A smaller number of patients developed a more progressive illness as described above, and an even smaller group developed full-blown encephalitis. Finally, there were the few critically ill patients with profound deliriums. Among those of this group who survived, the paucity of residual effects was remarkable. Observing the acute phase of the illness, one could not predict the outcome in terms of aftereffects to be seen 5 to 6 weeks later.

Ten persons died (see table), 8 females and 2 males. Eight had passed 40 years of age; 6 were 60 years of age or older. Most of the older patients also had degenerative diseases such as hypertension or arteriosclerosis, and two were asthmatic. Only 2 were ill longer than 2 weeks.

The course of the acute phase of illness is graphically portrayed for 5 hospitalized indi-

Figure 2. The course of a severe case with aftereffects.



viduals. Case R. A. (fig. 1) was the patient from whom St. Louis virus was isolated. The course was quite fulminant and lasted but 5½ days. Case B. S. (fig. 2) was the most severely ill of those patients who survived. The period of mental confusion was far longer than that seen in other patients. Figures 3, 4, and 5 illustrate the more usual clinical course of severely ill patients who, after recovery from the febrile, confused, early phase of the illness, appeared to be quite well except for weakness and tremors. Case C. A. (fig. 5) was the only individual seen by the investigators who had a paralytic component, a transient left facial weakness.

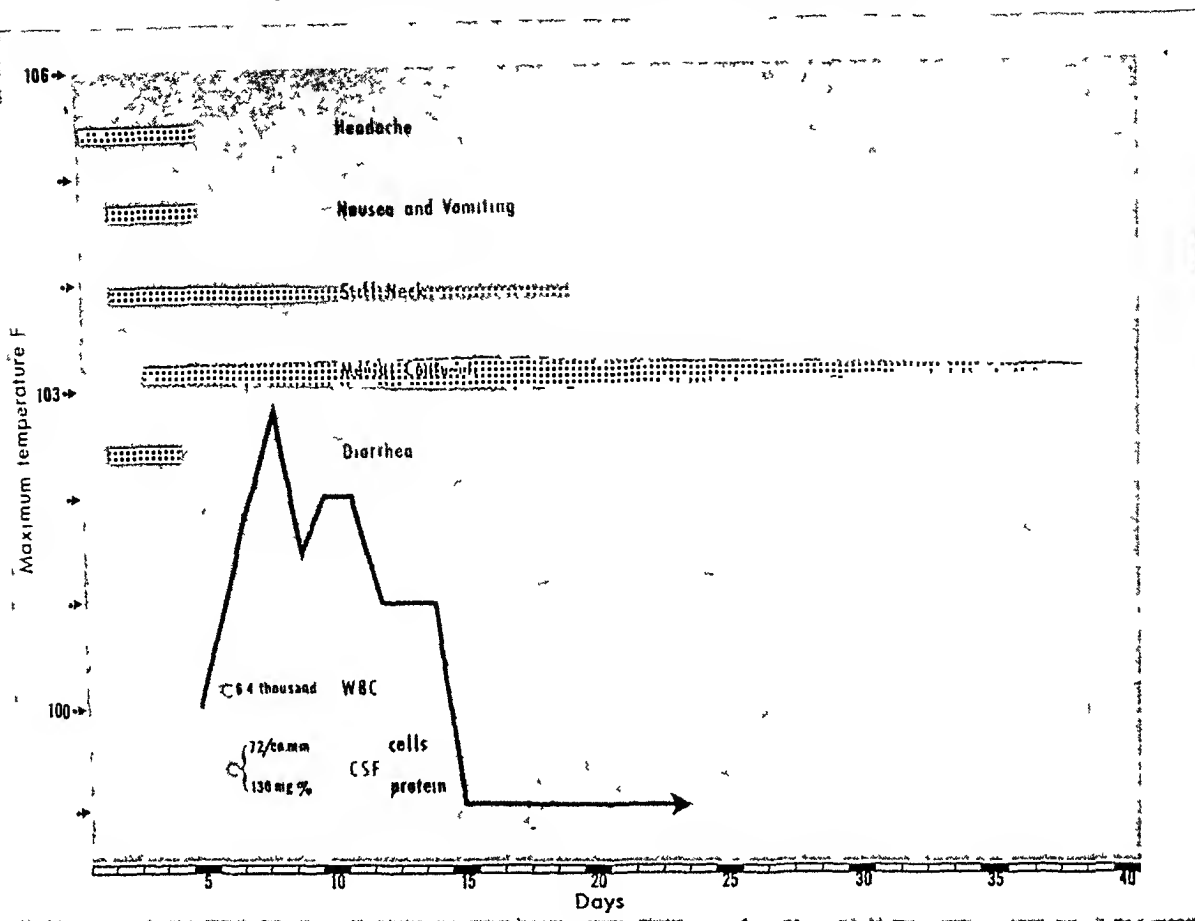
Clinical Laboratory Findings

For most of the patients, laboratory studies consisted of a single test performed in the acute phase of the illness. The white blood count was reported in 118 cases. Leukocytosis was

moderate, with almost half of the cases exhibiting counts greater than 10,000 cells per cu. mm., but only 7 (about 6 percent) showing counts over 20,000 cells per cu. mm. Two patients had less than 4,000 cells per cu. mm. In general, the ranges were evenly divided among all age groups, the younger patients tending to have a greater leukocytosis. There was no breakdown for differential counts.

Spinal fluid data were reported in 110 cases. Eighty percent demonstrated a pleocytosis greater than 10 cells per cu. mm. in the cerebrospinal fluid (CSF). The majority of patients had counts in the range of 50–250 cells per cu. mm. Only 3, or slightly more than 2 percent, had a cell count greater than 500 per cu. mm. In general, the younger patients had a greater pleocytosis than those in the older age groups. There was no direct correlation between severity of illness and CSF cell count. Differential

Figure 3. The course of a severe case with good recovery.



counts reported in 40 specimens performed during the acute illness demonstrated that polymorphonuclear cells predominated. In a few individuals tapped later in the course, the cells generally were mononuclear.

The CSF protein as determined in 92 patients was elevated above 40 mg. percent in about 80 percent of cases. In a few, values over 200 mg. percent were recorded.

Neuropathological Findings

Pathological examination was performed on the brain tissue of 3 fatal cases, including 1 from which the virus was isolated.

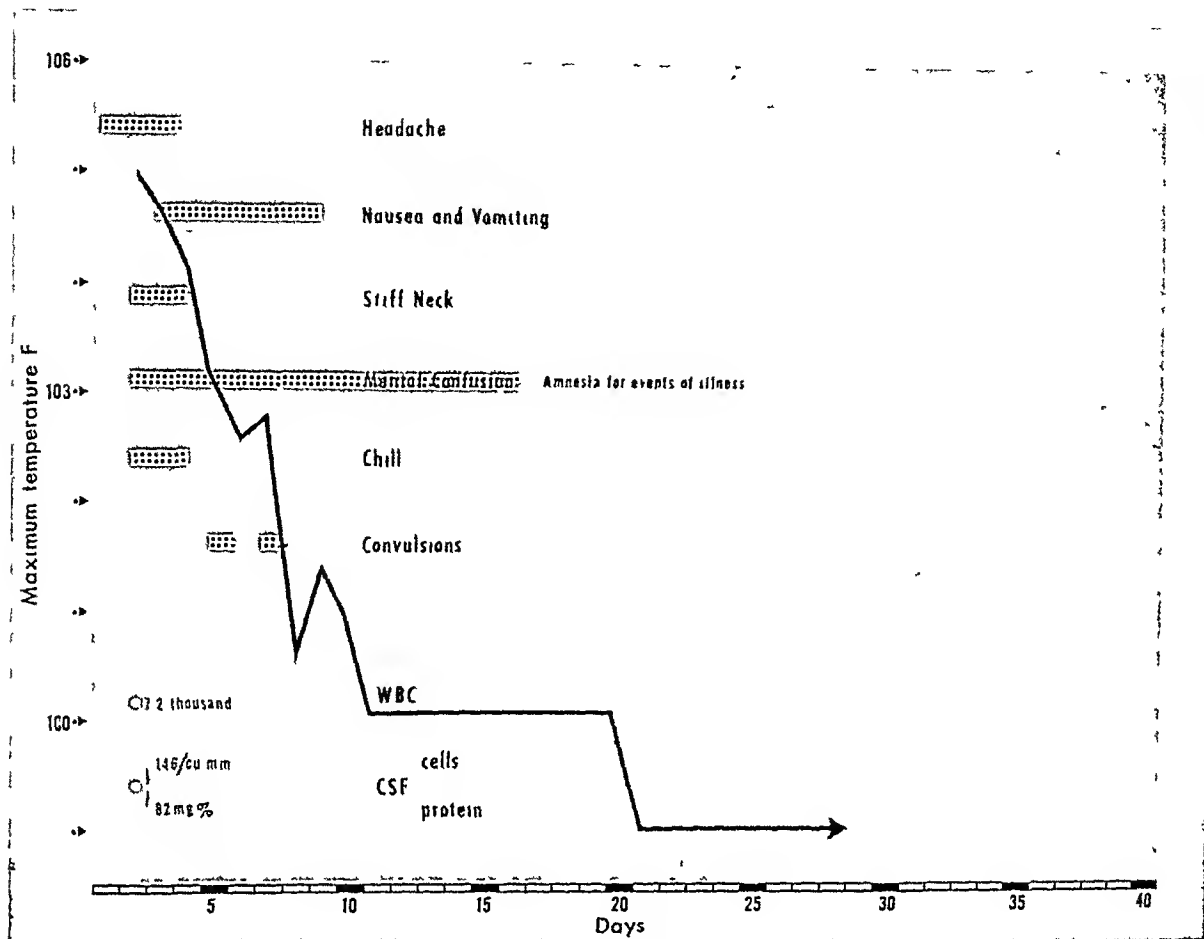
Gross findings were reported normal in one case autopsied by a local physician. In the others the brain tissue was diffusely edematous and hyperemic. The meninges were thickened and the meningeal vessels were congested. On sectioning, petechial hemorrhages and discolor-

ation were found in the gray matter. The tissue was soft and pliable.

On microscopic examination, the leptomeninges were thickened and the blood vessels congested and dilated. The histological changes in the brain consisted of perivascular infiltration, proliferation of microglial cells, and neuronal degeneration. These lesions were observed in all parts of the brain, in the white matter as well as in the gray matter, with the basal structures most intensely affected. Extravasation of blood into perivascular spaces and petechial hemorrhages into the brain substance were also encountered.

Microglial proliferations were frequently seen, although they were not so common as perivascular infiltrations. These lesions appeared as focal collections of inflammatory cells, the bulk of which consisted primarily of proliferated microglial cells. Under low-power

Figure 4. A severe case in a Mexican farm laborer (bracero) with good recovery, exhibiting amnesia for the events of his illness.



magnification, these foci appeared as glial nodules. In the areas with more intense cellular infiltration, neuronophagia could be noted. Several states of degeneration were observed in nerve cells, varying from mild cytoplasmic changes to complete cellular destruction.

Discussion

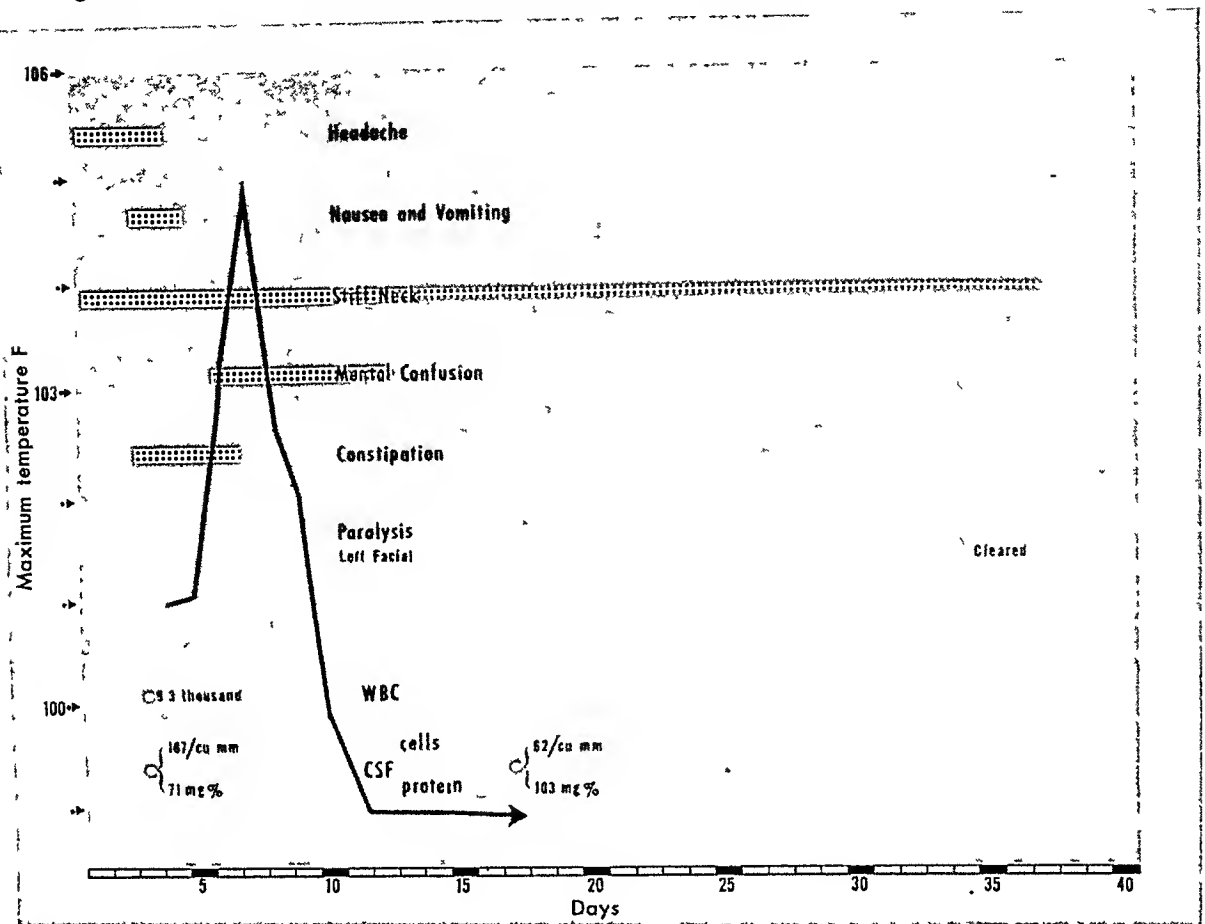
On a clinical basis, this epidemic may be described as a generally mild, occasionally severe encephalitis with a high morbidity, a low mortality, and an approximately equal sex ratio. Remarkable features are acute onset with the development of high fever, usually clearing by lysis, severe headache, and striking recoveries in severely ill patients after prolonged coma and convulsions. This study was confined to a 5- to 6-week followup after onset. Person-

ality changes during the acute illness were profound in a number of individuals but the prognosis for most should be good (2).

Although in the fatal cases lesions were distributed throughout the brain and were particularly noticeable in the basal structures, clinically, the higher integrative functions of the central nervous system were most profoundly disturbed. Paralysis, ocular palsies, and discrete localization of neurological signs were infrequent. The dulling of effect and intellectual functions, generalized weakness, and bilateral tremor of the hands were pronounced features in the convalescent patient.

The laboratory findings of a moderate pleocytosis and an elevated spinal fluid protein were typical of aseptic meningitis, and pathologically the lesions were consistent with those of the arthropod-borne encephalitides (3, 4).

Figure 5. The course of a moderately severe case exhibiting transient left facial weakness.



The findings were not diagnostic of St. Louis encephalitis itself and could not be used as criteria to differentiate it from other encephalitides.

Most of the patients who died had some form of chronic disease which probably contributed to death, and most of them were over 50 years of age. Clinically, this epidemic displayed many of the features of St. Louis encephalitis, and this diagnosis is entirely compatible with the findings.

Summary

The description of the clinical and pathological features of the 1954 outbreak of encephalitis in the Hidalgo area of Texas is based on 20 cases studied by Kunin, 373 cases reported on clinical-epidemiological forms, and results of 3 autopsies. It is concluded that the clinical and pathological features of this epidemic are

similar to those previously described for St. Louis encephalitis.

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Laboratory Aspects

THELMA D. SULLIVAN, M.S., J. V. IRONS, Sc.D., and M. MICHAEL SIGEL, Ph.D.

SPECIMENS from persons with encephalitis and those taken at autopsy were tested extensively in laboratory studies of the 1954 outbreak in Texas. Pooled mosquitoes from the affected area, the Lower Rio Grande Valley, were also examined for the presence of St. Louis encephalitis virus.

Methods and Materials

White Swiss mice have proved useful (1) for the recovery and identification of the encephalitis viruses and for the performance of serum virus neutralization tests (2, 3). Mouse brain antigens also have been useful in the performance of the complement fixation tests (4-6) as a diagnostic aid.

Ten percent brain suspension from two fatal cases was employed for attempted recovery of an agent by the inoculation of mice, chick embryos, baby chicks, and HeLa cell cultures. An agent also was sought in a few selected stools, throat swabs, and serums and spinal fluids by the inoculation of tissue cultures and mice.

For the determination of antibody content of selected serums, the virus neutralization test was employed. The screening test was based on 10 and 100 LD₅₀ doses of virus mixed with equal quantities of uninactivated undiluted

serum; subsequent tests made use of larger doses of virus. Three-week-old white Swiss mice were inoculated intracerebrally and were observed for 2 weeks.

The complement fixation test was performed at the Texas State Department of Health laboratory with 0.25 ml. of twofold serum dilutions, 0.25 ml. of antigen at the optimal dilution, 0.5 ml. of complement (2 exact units), and 0.5 ml. of sensitized sheep cells containing amboceptor in optimal dilutions. At the Virus and Rickettsia Laboratory of the Communicable Disease Center in Montgomery, Ala., the corresponding amounts were 0.1 ml. of serum, 0.1 ml. of antigen, and 0.2 ml. of complement (1½ to 2 units). The primary incubation was done overnight in the cold room. A full set of controls and a supplementary amboceptor titration were included. The second incubation was carried out for 1 hour at 37° C. (½ hour at the CDC laboratory).

The degree of hemolysis was recorded after 2 hours' refrigeration. (In the CDC laboratory the test was read directly without additional refrigeration.) Titers were based on the last tube showing a 3+ or 4+ fixation. Lederle antigens were employed, except that in addition to the Lederle St. Louis antigen, a second St. Louis antigen and control were prepared from mouse brains at the Texas laboratory by the method of España and Hammon (7), and the influenza and mumps antigens were made at the CDC laboratory in Montgomery. All serum samples from the same patient were tested simultaneously when they were available. Most of the specimens were split for tests in both laboratories.

Paired serum specimens from cases showing poor or no serologic response to St. Louis antigen were also screened with western equine

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encephalitis (WEE), eastern equine encephalitis (EEE), and lymphocytic choriomeningitis (LCM) antigens, and some were screened with mumps, influenza, and other antigens.

More than 2,000 adult mosquito specimens were collected by the entomological team and sent to the laboratory for virus isolation studies. The majority were received in a frozen state, but a few were sent alive to the State laboratory.

In the laboratory, the mosquitoes were pooled for animal inoculation, separation being based on species and place of collection. A suspension of the macerated mosquitoes was spun in a re-

frigerated centrifuge, and antibiotics were added to the supernatant. Infant mice were inoculated with subpool material by the subdural and intraperitoneal routes, and a guinea pig received an overall pool in a like manner. Two further brain passages were made in mice before a test was considered negative. The guinea pig was bled a month later for serologic studies.

Results

Several isolation attempts were made with brain tissues from R.A. and C.H., two patients

Table 1. Complement fixation antibody pattern of 110 serum samples

| Base-line serum taken (days) | Results | Followup serum taken (days) | | | | | | |
|------------------------------|----------------|-----------------------------|------|-------|-------|-------|-------|-------|
| | | 0-7 | 8-14 | 15-21 | 22-36 | 37-56 | 57-85 | Later |
| 0-7 | Negative..... | 3 | 2 | 4 | 2 | 1 | | |
| | <4>4..... | | | | | | | |
| | No change..... | | | | | | | |
| | Rise..... | | | | | | | |
| | Decline..... | | | | | | | |
| | Total..... | 3 | 10 | 12 | 16 | 8 | | |
| 8-14 | Negative..... | | | 1 | 1 | 2 | | |
| | No change..... | | | | | | | |
| | Rise..... | | | | | | | |
| | Decline..... | | | | | | | |
| | Total..... | | | 2 | 15 | 10 | 2 | |
| 15-21 | Negative..... | | | | | 3 | | |
| | No change..... | | | | | | | |
| | Rise..... | | | | | | | |
| | Decline..... | | | | | | | |
| | Total..... | | | | | 5 | 5 | |
| 22-36 | Negative..... | | | | | 1 | | |
| | No change..... | | | | | | | |
| | Rise..... | | | | | | | |
| | Decline..... | | | | | | | |
| | Total..... | | | | | 6 | 6 | 3 |
| 37-56 | Negative..... | | | | | | 1 | |
| | No change..... | | | | | | | |
| | Rise..... | | | | | | | |
| | Decline..... | | | | | | | |
| | Total..... | | | | | | 2 | 3 |
| 57-85 | Negative..... | | | | | | | |
| | No change..... | | | | | | | |
| | Rise..... | | | | | | | |
| | Decline..... | | | | | | | |
| | Total..... | | | | | | | 2 |
| | Total..... | | | | | | | 2 |

NOTE: No change means antibodies present, but without significant fourfold rise.

Table 2. Range of complement fixation titers for St. Louis encephalitis, by week after onset of illness

| Number of weeks after onset of illness | Total number of serums tested | Range of complement fixation titers | | |
|--|-------------------------------|-------------------------------------|---------|------|
| | | Lowest | Highest | Mean |
| 1----- | 56 | <1:4 | 1:16 | <1:4 |
| 2----- | 55 | <1:4 | 1:128 | 1:8 |
| 3----- | 34 | <1:4 | 1:256 | 1:16 |
| 4-5----- | 54 | <1:4 | 1:128 | 1:16 |
| 6-8----- | 35 | <1:4 | 1:128 | 1:16 |
| 9-12----- | 14 | <1:4 | 1:64 | 1:16 |
| 20-22----- | 8 | <1:4 | 1:16 | <1:4 |

who died. An agent was recovered with brain tissues from R.A. by the intracerebral inoculation of 2-week-old and 17-day-old mice. Two-week-old mice showed evidence of infection by the 7th day and on passage by the 6th day. When one 17-day-old mouse was found dead on the 6th day, two mice which were not ill were sacrificed on the 7th day for "blind passage" in young adult mice. These mice showed evidence of infection by the 5th or 6th day. Three-week-old mice were much less satisfactory for primary isolation. The R.A. agent was not lethal for chick embryos and produced no obvious illness in guinea pigs. It was identified as SLE virus by means of a neutralization test.

Stools from 17 cases, 10 early acute phase serum samples, 7 throat swabs, and 6 spinal fluids failed to yield an agent by inoculation and by attempted "blind passage" in infant or young adult mice. Negative results were also obtained from inoculations of baby chicks and strain HeLa tissue cultures.

A total of 29 pools of mosquitoes, comprised of 1,613 specimens representing 11 species, were tested for presence of virus, with the result that

two strains of St. Louis virus were isolated from *Culex quinquefasciatus* collected at Edinburg in September 1954.

The serologic results obtained on the divided specimens in the two laboratories were in essential agreement. The results used for the tables, with the exception of the serum-virus neutralization tests, were obtained primarily at the Texas bureau of laboratories.

In complement fixation tests, fourfold or greater titer rises were demonstrated in 38 cases, representing 43.7 percent of the 87 cases tested. Paired serum samples from 17 cases failed to show complement fixation titers, at least at the 1:4 (3+) level, and 32 cases showed no significant change in titer. Tests on serums collected after the 13th week were excluded. The extent of change in titer of serums collected from 57 patients is shown in table 1. Only 1 of 29 paired serum samples collected up to the 9th week showed a decreasing titer, but 6 of 8 pairs of samples taken 20 to 22 weeks after onset of illness showed greatly decreased or totally absent titers. Mean titers by week after onset of illness are shown in table 2. The titers ranged from less than 1:4 (3+) through 1:256 (4+).

Seventy percent of the serums collected from 50 persons, who presumably were exposed but not ill, had titers from 1:4 through 1:128 (table 3). These specimens were collected at the close of the epidemic, mainly from other members of families in which proved cases of SLE had occurred.

Serum-virus neutralization tests were performed on paired serums from 7 cases and single serums from several cases. The relation of the neutralization indexes to the complement fixation titers on paired serums is shown in table 4.

Paired serum samples from 12 clinically diagnosed cases showed no antibodies or failed to

Table 3. Results of complement fixation tests for St. Louis encephalitis on persons not ill during outbreak of encephalitis in Lower Rio Grande Valley

| Number of persons tested | Number with complement fixing titer of— | | | | | | | Total number with titer of 1:4 or greater | Percentage of total with titer of 1:4 or greater |
|--------------------------|---|---|----|----|----|----|-----|---|--|
| | <4 | 4 | 8 | 16 | 32 | 64 | 128 | | |
| 50----- | 15 | 3 | 10 | 9 | 7 | 4 | 2 | 35 | 70.0 |

Table 4. Comparative data on complement fixation titers and neutralization indexes on cases in outbreak of St. Louis encephalitis in the Lower Rio Grande Valley

| Case No. | Date of onset of illness | Date specimen taken | Complement fixation titer | | | | Neutralization index |
|----------|--------------------------|---------------------|---------------------------|-------|-------|-------|----------------------|
| | | | 8 | 16 | 32 | 64 | |
| 8..... | 9-4 | 9-4 | ----- | ----- | ----- | ----- | 0 |
| | | 9-20 | ----- | ----- | ----- | ----- | 0 |
| 13..... | 8-12 | 9-17 | 4 | 4 | ----- | ----- | 21 |
| | | 10-20 | 4 | 3 | ----- | ----- | 32 |
| 14..... | 8-25 | 8-27 | ----- | ----- | ----- | ----- | 0 |
| | | 9-17 | 4 | 4 | 4 | 4 | 14 |
| 16..... | 8-31 | 9-13 | ----- | ----- | ----- | ----- | 0 |
| | | 9-20 | ----- | ----- | ----- | ----- | 0 |
| 19..... | 8-19 | 8-27 | ----- | ----- | ----- | ----- | 0 |
| | | 9-16 | 4 | 4 | 4 | ----- | 68 |
| 27..... | 9-12 | 9-23 | ----- | ----- | ----- | ----- | 0 |
| | | 10-23 | ----- | ----- | ----- | ----- | 0 |
| 29..... | 9-4 | 9-4 | ----- | ----- | ----- | ----- | 14 |
| | | 10-22 | 2 | ----- | ----- | ----- | 68 |
| 51..... | 9-2 | 9-14 | 4 | 4 | ----- | ----- | 140 |
| | | 10-22 | 4 | 4 | 3 | ----- | 140 |
| 67..... | 8-17 | 9-20 | 3 | ----- | ----- | ----- | 68 |
| | | 10-23 | 3 | ----- | ----- | ----- | 140 |
| 82..... | 8-30 | 9-23 | 4 | 3 | ----- | ----- | 21 |
| | | 10-23 | 4 | 4 | 4 | 4 | 210 |

show a significant increase in titer in complement fixation tests in which SLE, WEE, EEE, and LCM antigens were utilized. Single serums from several cases also were negative in the WEE test. Paired samples of serum from 7 cases were negative in hemagglutination-inhibition tests for influenza A, A-prime, and B. Four paired serum samples were negative for mumps, typhus, Q fever, and diseases of the lymphogranuloma venereum and psittacosis group. Paired samples from 2 cases and a single serum from each of 6 cases were negative in the complement fixation test with Venezuelan equine antigen supplied by Dr. E. H. Lennette of the California State Health Department. Similarly, 4 serums were negative for Japanese B encephalitis and herpes. Agglutination tests with the "febrile" bacterial antigens were essentially negative.

Discussion

In our experience positive results are a rarity in serums submitted from sporadic cases of encephalitis. This had been the experience of Casals (8) also. In fact, the validity of the CF test in SLE has occasionally been questioned. By contrast, the findings from the current study indicate that CF antibodies to the causative

agent are readily demonstrable in the great majority of patients in an epidemic. Thus, 70 of 87 patients (80.5 percent) were found to possess antibodies to the SLE virus, and 38 of these 87 (43.7 percent) showed a significant rise in titer.

These results confirm the observation of Howitt (4) and supply more evidence for the value of the CF test in the diagnosis of SLE. Demonstrations of a significant rise in titer required proper spacing of specimens. When the first specimen was taken during the first week of illness and the second specimen was collected during the second and third weeks of illness, 9 of 22 individuals showed a rise in titer. The rise was encountered most frequently between 22 and 36 days (11 of 16). The comparison of results obtained when the baseline serum was taken during the second week of illness and the followup serum samples 3, 4, 5, or more weeks after onset revealed a fourfold or greater rise in 11 of 29 patients. Using as baseline the samples of serum taken during the third week, there were only 2 rises among serum samples of 10 patients.

In 10 of 46 patients, antibodies present during the first week exhibited no significant rise during subsequent weeks. This suggests two possibilities: Either the CF antibodies to SLE develop quite early in some patients or the in-

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|--------------------------|---|---|----|----|----|----|-----|---|--|
| | <4 | 4 | 8 | 16 | 32 | 64 | 128 | | |
| 50----- | 15 | 3 | 10 | 9 | 7 | 4 | 2 | 35 | 70.0 |

Vector Evaluation and Control

LESLIE D. BEADLE, M.A., GEORGE C. MENZIES, M.S., GEORGE R. HAYES, Jr., M.S.,
FRANK J. VON ZUBEN, Jr., C. E., and RICHARD B. EADS, Ph.D.

THE likelihood that the encephalitis reported in the 1954 Texas outbreak might be borne by mosquitoes or other arthropod vectors prompted an entomological investigation which commenced in late August. After the appraisal, a vector control program was initiated.

At least three distinct viruses have been shown to be responsible for periodic outbreaks of infectious encephalitis in the United States. Two of these, eastern equine encephalitis and western equine encephalitis, also occur in epizootic form in horses. The third, St. Louis encephalitis, does not produce clinically recognizable symptoms in horses. Both man and horses are generally believed to be dead ends in the infection chain in nature. The viremic blood levels are seldom high enough in either to infect even the most efficient vectors. Studies on these viruses have demonstrated that birds are the most common vertebrate hosts and mosquitoes the most significant vectors.

Background

The Lower Rio Grande Valley of Texas is a semitropical area with a climate and topography especially propitious for the production of mosquitoes. Several species of the local mosquito fauna are not found in other sections of the United States. The average annual rainfall is about 24 inches and natural

drainage is poor. The elevation is only 40 to 200 feet above sea level, and prolific vegetation clogs the drainage ditches. The mean average temperature is 72° F., and killing frosts are seldom experienced.

Conditions favorable for mosquito production existed in Hidalgo County, located in this area, in the spring of 1954. During the period April 8-14 an average of 10 inches of rain fell over an extensive irrigated section. The nature of the terrain permitted large residual bodies of water to stand for varying periods of time. A reconnaissance survey of the flooded area revealed that emergency mosquito control measures were needed throughout the urban and rural areas of a section bounded by the cities of Edinburg on the northwest, Pharr on the southwest, Donna on the southeast, and Elsa on the northeast (see map, p. 511). Spot mosquito control was also necessary in residual floodwater areas as far west as Mission and as far east as Mercedes.

On April 16 the Governor of Texas declared a state of emergency in Hidalgo County. Following a request for assistance from the county health officer, the Texas State Department of Health and the Public Health Service combined forces to provide technical assistance, labor, equipment, and insecticides for an emergency mosquito control program. During the period April 22-May 8 a total of about 1,784 acres of water was larvicided, 13,942 acres space-sprayed (adulticided), and 304 premises residual-sprayed (1). Since numerous artificial containers in and adjacent to private premises were filled with water and presented a problem beyond the scope of an emergency control crew, the press and radio were utilized to

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formation about the date of onset was inaccurate. Howitt (4) recorded positive reactions in 12 of 26 serums taken prior to the end of the first week.

The CF antibodies to the SLE virus were found to decline fairly rapidly. Thus, 6 of 8 patients showed a fourfold or greater decrease in titer in serums obtained beyond the 85th day after onset. Unchanged titers were still present, however, in two individuals. The relatively quick antibody decline was also noted by Howitt (4).

Among the serum samples collected from persons who presumably were exposed but who were not ill, 70 percent contained CF antibodies. This finding provides evidence that the virus may cause many inapparent infections.

The success in obtaining useful serologic information was primarily due to the availability of multiple specimens. This study reemphasizes the need for comparative testing of two (and sometimes more) specimens from a patient. Although in this study the infection with SLE virus was associated with a pattern consisting of antibody rise after the first week of illness (most rises were detected between 22 and 36 days) and antibody decline after 3 months, the variability in time of antibody appearance, in the rate of antibody rise, and in the rate of antibody fall makes it difficult and often impossible to interpret validly the results of a single serum.

Laboratories that may be called upon to perform similar tests in the future are cautioned about the reliance on standardization of antigens prepared outside their laboratories. Failure to assay each antigen for its CF activity using several positive serums and the investigator's technique which will later be used in the test may lead to weak and inconclusive reactions.

The neutralization test also yielded positive results. However, the number of serum samples tested was too small to warrant specific conclusions.

Summary

In studies of human cases, virologic and serologic tests proved that the epidemic of encephalitis in the Lower Rio Grande Valley of Texas in 1954 was caused by the St. Louis type of virus. Isolation of St. Louis encephalitis virus from two pools of *Culex quinquefasciatus* taken in the areas supported the diagnosis.

The complement fixation test was found to be of great value.

Detection of significant rise in titer required proper spacing of specimens.

It was found that inapparent infections had occurred with great frequency.

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species. Next in abundance were *C. coronator* (7.1 percent) and *A. vexans* (5.1 percent).

Eleven species of mosquitoes (1,613 specimens) comprising 29 pools were tested for virus (table 4). Two strains of St. Louis virus were isolated from *C. quinquefasciatus* collected at Edinburg in September 1954.

Discussion

Culex tarsalis, the mosquito reputed to be the principal vector of infectious encephalitis in western States, was not encountered during the entomologic investigation. It is considered uncommon in the Lower Rio Grande Valley. Hammon and associates (2) report that of approximately 23,000 mosquitoes gathered during encephalitis studies conducted in Cameron County, Tex., during the summer of 1942, only 60 were *C. tarsalis*. This is somewhat surprising since this species is abundant throughout the remainder of the State and conditions appear

favorable for its development in this section.

The species is believed to be the principal vector of St. Louis encephalitis in California on the basis of the frequency of virus isolations. Reeves (3), Longshore and Stevens (4), and Lennette (5) report that 197 isolations of St. Louis virus have been made from *C. tarsalis* in California. There have been only three isolations of this virus from pooled *C. quinquefasciatus* mosquitoes collected in California (3). Investigations by Chamberlain and associates (6), comparing the potential of many common mosquitoes as vectors of eastern and western equine encephalitis, showed that *C. quinquefasciatus* was a very poor vector from the standpoint of threshold of infection, infection rate, and transmission rate. Even when the virus was highly concentrated in the blood of the host (10^7 to $10^{8.5}$), a negligible percentage became infected, and the few that became infected were poor transmitting agents.

Table 2. Number of mosquitoes collected in shelters, Hidalgo County, Tex., September 6-14, 1954

| Species | Alamo (1) | Ed- couch (2) | Edin- burg (8) | Hid- algo (3) | McAl- len (3) | Mer- cedes (4) | Mis- sion (7) | Pharr (4) | Wes- laco (3) | Total (35) | Per- cent |
|--|--------------|---------------------|----------------------|---------------------|---------------------|----------------------|---------------------|--------------|---------------------|---------------|--------------|
| <i>Culex quinquefasciatus</i> | 50 | 144 | 341 | 25 | 69 | 24 | 256 | 66 | 47 | 1,022 | 94.3 |
| <i>Anopheles quadrimaculatus</i> | | 11 | 2 | 2 | | 24 | | | 5 | 44 | 4.0 |
| <i>Culex erraticus</i> | | | | | | 8 | | | 6 | 14 | 1.2 |
| <i>Anopheles crucians</i> | | | | | | 1 | | | | 1 | .1 |
| <i>Culex coronator</i> | | | 1 | | | | | | | 1 | .1 |
| <i>Psorophora confinis</i> | | | | | | | | 1 | | 1 | .1 |
| Total..... | 50 | 155 | 344 | 27 | 69 | 57 | 256 | 67 | 58 | 1,083 | 99.8 |

NOTE: Number of collections in parentheses.

Table 3. Number of mosquitoes taken in evening biting collections (human bait) at five localities, Hidalgo County, Tex., September 6-10, 1954

| Species | Pharr 9/6/54 | Donna 9/7/54 | Mission 9/8/54 | Weslaco 9/9/54 | Mercedes 9/10/54 | Total | Percent |
|--|-----------------|-----------------|-------------------|-------------------|---------------------|-------|---------|
| <i>Culex quinquefasciatus</i> | 3 | | 221 | 86 | 2 | 312 | 76.6 |
| <i>Culex coronator</i> | | 2 | | 4 | 23 | 29 | 7.1 |
| <i>Aedes vexans</i> | 1 | 18 | | | 2 | 21 | 5.1 |
| <i>Psorophora confinis</i> | 1 | 9 | | | 3 | 13 | 3.0 |
| <i>Aedes scapularis</i> | | 8 | | 1 | | 9 | 2.2 |
| <i>Culex salinarius</i> | | | | | 9 | 9 | 2.2 |
| <i>Anopheles quadrimaculatus</i> | | 5 | | | 1 | 6 | 1.4 |
| <i>Aedes sollicitans</i> | | 4 | 1 | | | 5 | 1.2 |
| <i>Culex erraticus</i> | | 2 | | | 1 | 3 | .7 |
| Total..... | 5 | 48 | 222 | 91 | 41 | 407 | 99.5 |

NOTE: Collecting periods were 2 hours in length (from 7 to 9 p. m.).

instruct the public in simple mosquito control measures. Heavy earth-moving equipment was brought in by the Texas Highway Department for constructing channels to drain the larger bodies of standing water. An extensive inspection survey on May 7 indicated that the adult mosquito population had been reduced to negligible levels.

Vector Evaluation

Representative samples of mosquito larvae were collected during the week of August 30 to September 4 from such habitats as roadside ditches, rain pools, seepages, dairy drains, sewage plants, reservoirs, and artificial containers on premises. Four species were represented in these collections: *Psorophora confinnis*, *Culex quinquefasciatus*, *Culex coronator*, and *Aedes vexans*. *P. confinnis* was predominant in temporary water habitats produced by rainfall during the week prior to the investigation. *C. quinquefasciatus*, the most prevalent, was found breeding in artificial containers, especially those used for watering domestic animals, and in semipermanent ground pools and drainage ditches, particularly near sewage disposal plants.

Collecting adult mosquitoes was emphasized for virus recovery tests. Specimens were gathered by the use of 3 New Jersey-type light traps, by 3 inspectors hand-collecting from shelters, and by 1 inspector assigned to biting collections. Most collecting was concentrated in

areas where encephalitis cases had been reported. The majority of specimens collected for virus recovery tests were lightly anesthetized with chloroform, identified, sealed in Wassermann tubes, and sent to the laboratories in a frozen state. The remainder were sent alive to the State laboratory.

A diligent search for adult mosquitoes resulted in only about 2,000 specimens during 2 weeks of collecting. This was attributed to prevailing dry and hot weather immediately preceding the outbreak and to the intensive mosquito control operations following the April flood.

The scarcity of mosquitoes in the area is revealed by the fact that only 530 female mosquitoes were collected during 19 trap nights (table 1). *P. confinnis* ranked first (61.3 percent), followed by *C. quinquefasciatus* (13.7 percent) and *Aedes sollicitans* (13.0 percent).

Hand collections in animal shelters, garages, and outbuildings indicated that *C. quinquefasciatus* was by far the most common species of adult mosquito in both urban and rural areas (table 2). Approximately 94 percent of all specimens collected (1,083) were of this species.

Biting collections of mosquitoes alighting on exposed skin of the human observer were made at night in five residential areas. These collections indicated that *C. quinquefasciatus* was the predominant pest species in the area during the time of the study (table 3). Over 76 percent of the 407 specimens collected were of this

Table 1. Number of mosquitoes taken in light traps at six localities, Hidalgo County, Tex., September 6-12, 1954

| Species | Donna (4) | Edin- burg (3) | Mc- Allen (1) | Mission (8) | Pharr (2) | Weslaco (1) | Total (19) | Percent |
|--|--------------|----------------------|---------------------|----------------|--------------|----------------|---------------|---------|
| <i>Psorophora confinnis</i> | 33 | 76 | 28 | 14 | 164 | 10 | 325 | 61.3 |
| <i>Culex quinquefasciatus</i> | 10 | 3 | 50 | 3 | 9 | 1 | 73 | 13.7 |
| <i>Aedes sollicitans</i> | 50 | 1 | 12 | 3 | 1 | 2 | 69 | 13.0 |
| <i>Aedes vexans</i> | 31 | 7 | | | | | 38 | 7.1 |
| <i>Anopheles quadrimaculatus</i> | 8 | | | 1 | 2 | | 11 | 2.0 |
| <i>Culex coronator</i> | 5 | 4 | | | | | 9 | 1.6 |
| <i>Culex erraticus</i> | 1 | 1 | | | | | 2 | .3 |
| <i>Aedes scapularis</i> | | 1 | | | | | 1 | .1 |
| <i>Culex salinarius</i> | 1 | | | | 1 | | 1 | .1 |
| <i>Psorophora signipennis</i> | | | | | | | 1 | .1 |
| Total..... | 139 | 93 | 40 | 68 | 177 | 13 | 530 | 99.3 |

NOTE: Number of trap nights in parenthesis.

cidal treatments were provided twice to the areas involved. Intermittent heavy showers complicated the problem by increasing the potential mosquito breeding areas and by hampering control operations. High winds also impeded operations.

Results

In space spraying and dusting operations, 3,310 gallons of 5 percent DDT emulsion and 21,000 pounds of 3 percent gamma isomer BHC dust were applied to 20,225 acres. DDT-diesel oil larvicide in the amount of 1,312 gallons was applied on 263 acres of both actual and potential mosquito breeding area. In all, 1,256 man-hours of labor were expended. A population of approximately 72,000 within 12 incorporated areas of the county received the protection of this routine work. Also, an unestimated additional number of persons in rural areas derived benefits from nonroutine work, mostly larviciding.

Inspections of resting places of adult mosquitoes and larval habitats disclosed that the populations had been reduced to satisfactory levels.

Summary

An entomological survey and mosquito control operations were conducted during the late summer of 1954 in connection with an outbreak of encephalitis in the Lower Rio Grande Valley of Texas.

Larval and adult collections showed that the predominant mosquito species present in the affected area were *Culex quinquefasciatus* and *Psorophora confinnis*.

Eleven species of mosquitoes (1,613 specimens) comprising 29 pools were tested for virus. Two strains of St. Louis encephalitis virus were isolated from *Culex quinquefasciatus*

collected at Edinburg, Tex., in September 1954.

Mosquito control operations were carried on within the area from September 9 to 23. They consisted of adulticidal treatment in urban areas with 5 percent DDT spray or 3 percent gamma isomer BHC dust, and larvicidal treatment in all urban and some rural areas with 5 percent DDT emulsion. A human population of approximately 72,000 within 12 incorporated cities and towns received protection from this work. Inspections disclosed that mosquito populations had been reduced to satisfactory levels.

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Table 4. Hidalgo County mosquitoes tested for viruses, 1954 outbreak of encephalitis

| Species | Number tested | Number of pools | Number of positive pools (SLE) |
|--|---------------|-----------------|--------------------------------|
| <i>Culex quinquefasciatus</i> ----- | 1, 095 | 15 | 1 2 |
| <i>Psorophora confinnis</i> ----- | 326 | 3 | 0 |
| <i>Aedes sollicitans</i> ----- | 69 | 1 | 0 |
| <i>Anopheles quadrimaculatus</i> ----- | 55 | 3 | 0 |
| <i>Aedes vexans</i> ----- | 38 | 1 | 0 |
| <i>Culex erraticus</i> ----- | 16 | 1 | 0 |
| <i>Culex coronator</i> ----- | 10 | 1 | 0 |
| <i>Aedes scapularis</i> ----- | 1 | 1 | 0 |
| <i>Culex salinarius</i> ----- | 1 | 1 | 0 |
| <i>Anopheles crucians</i> ----- | 1 | 1 | 0 |
| <i>Psorophora signipennis</i> ----- | 1 | 1 | 0 |
| Total----- | 1, 613 | 29 | 2 |

¹ Edinburg.

Reeves (3) concludes, however, that vector mosquitoes do not require such high host titers to become infected with St. Louis virus as is the case with the other two viruses. Hammon and associates (2) report positive St. Louis encephalitis transmission experiments employing California strains of *C. quinquefasciatus*. During the notable epidemic of St. Louis encephalitis in the St. Louis area in 1933, circumstantial evidence implicated *Culex pipiens-quinquefasciatus* mosquitoes as vectors of the disease (7).

The isolation of virus from mosquitoes collected in the field does not definitely incriminate a species as a significant vector of the disease since any bloodsucking arthropod may temporarily carry the disease agent in a freshly ingested blood meal taken from an infected animal during a viremic phase. Coupled with epidemiological observations, however, the isolation of St. Louis virus from pooled *C. quinquefasciatus* during the Rio Grande Valley epidemic strongly suggests that it was the principal vector.

Vector Control

In times of emergency, personnel and equipment of a number of different organizations and levels of government may join forces and function as a single organization. Most fre-

quently operations are under the direct administrative supervision of local authorities, who are familiar with local needs and with the problems. Such was the case with the aid provided during this encephalitis epidemic in Hidalgo County. The county health officer served as overall director. Supervisory personnel responsible for planning and directing operations were from the Hidalgo County Health Unit, from the vector control section, bureau of sanitary engineering, Texas State Health Department, and from the Communicable Disease Center, Public Health Service. Equipment and insecticides were provided by Hidalgo County, the Texas State Health Department, and the CDC Disaster Aid Unit. The communicable Disease Center also assigned 18 temporary employees to insecticiding and inspection duties.

Since *C. tarsalis*, usually incriminated as the principal vector of encephalitis in the west, had not been found in the epidemic area, the insecticidal measures were directed against the larval and adult stages of all species of mosquitoes. For general larviciding, 5 percent DDT in diesel oil was applied with hand equipment as a mist on mosquito breeding areas. Roadside ditches and other accessible places were larvicided, however, with truck-mounted power spraying equipment dispersing 5 percent DDT emulsion. To control adults in urban areas of the county, space spraying and dusting were conducted during the hours of darkness. The spray was 5 percent DDT emulsion, and the dust contained 3 percent gamma isomer BHC. Although the large-scale use of dust for the control of adult mosquitoes within urban areas was apparently unprecedented, it resulted in an observed high degree of coverage and was therefore favored in this operation.

Space spraying and dusting were begun on the night of September 9 and hand larviciding on the following morning. Both spraying and dusting were done in all urban areas of the county and also in certain rural sections. Since much of the county is urbanized, a relatively large amount of the county was treated in this way. Larviciding was conducted in all urban and some rural areas. During the period September 9-23 both larvicidal and adulti-

Contrary to popular impression, diphtheria has not ceased to be of public concern in the Nation. Its occurrence and distribution suggest continued vigilance.

Present Distribution of Diphtheria in the United States

HELEN A. MOORE, M.D., and GRACE I. LARSEN, R.N.

AS a disease of public health importance, the annual total of approximately 2,000 cases places diphtheria before brucellosis, encephalitis, psittacosis, typhoid fever, or typhus fever, or any combination of the less common communicable diseases, such as malaria, human rabies, or anthrax.

At the same time, 2,000 cases of diphtheria yearly, distributed quite unequally, do not constitute a prevalence which gives the disease great preeminence in the minds of physicians or public health workers. Diagnostic acumen and laboratory and public health competency are now being maintained with difficulty or not at all. Such a diminution in awareness of and ability to diagnose diphtheria seems particularly unfortunate. The present low incidence of the disease suggests that this would be a propitious time to intensify all preventive measures and so assist in placing diphtheria in the museum along with cholera, yellow fever, and smallpox.

If diphtheria is to be attacked more appropriately and more vigorously than in the past,

Dr. Moore is chief of the Diphtheria Unit, Surveillance Section, and Miss Larsen was a nurse in this unit of the Epidemiology Branch, Communicable Disease Center, Public Health Service. Miss Larsen is now nursing consultant in charge of the venereal disease training program, bureau of nursing, New York City Health Department.

the present features of the problem must be known in some detail. The national reviews of Collins, Anderson, and Dauer are now some years in the past (1-3). Later discussions have dealt primarily with local problems (4-6). To bring the national picture up to date we have added to a résumé of earlier data reports for the most recent years.

Data on the occurrence of diphtheria cases and deaths were obtained primarily from publications of the Public Health Service's National Office of Vital Statistics: Morbidity and Mortality Weekly Reports and their annual supplements, and Vital Statistics of the United States. More detailed information was obtained from current communicable disease reports prepared by States for internal use and from the annual communicable disease statistics published by most States. Additional details were collected by personnel of the Public Health Service's Communicable Disease Center in connection with field assignments which dealt directly or indirectly with diphtheria. The assembling and review of such data are continuing functions of the Surveillance Section of the center.

National Morbidity and Mortality Rates

Annual morbidity and mortality rates for diphtheria have fallen sharply since 1933 and have not increased, even for a single year, since



These paragraphs, based on overseas reports from public health personnel with missions and field parties of the International Cooperation Administration, give a glimpse into health work abroad. Most of the original material appears in an administrative publication distributed by the Public Health Division of the ICA.

Training Midwives

Teaching the untrained midwives who deliver most of the babies in some 40,000 Iranian villages is an important part of our program. The village midwife is a respected member of the community who usually inherits her profession.

Midwives are taught what to do and what not to do. They no longer put *surnueh* (mascara) on a new baby's eyes or *lchakestar* (a mixture of oil and ashes which can cause tetanus) on the new baby's umbilical cord. They refer their "cases" to our prenatal classes and their babies to our "well baby clinics." They are our "health workers" in the villages.

Our course includes classes in management of labor and delivery, postpartum care, environmental sanitation, nutrition for mothers and babies, and personal hygiene. Attendance is by written request from the Ministry of Health. Supervision is continuous throughout the 3 or 4 months of instruction, aided at times, and in Isfahan especially, by physicians and *behyars* (public health nurse aides).

Graduates are presented with special midwifery bags and told to report every 2 weeks even if there have been no deliveries in that period.

By visiting the midwife in her home, we help her set an example of good health for her village. Each midwife has a "family folder." This means that she is registered at the health center, has had a physical examination, is subject to various health tests, and is taught the meaning and practice of good health habits.

Iranian mothers and children are fortunate in being cared for by these women.

—HELEN J. BAKHTIAR, R.N., *public health nurse consultant, United States Operations Mission, Iran.*

The Waters of Illampu

To a 100-year-old *Amauta* (Aymara sage), potable water for the village of Warisata was the dream of a long lifetime. Warisata nestles in the foothills of Bolivia's highest peak, snow-covered Illampu. The water supply for the Aymaras, an extensive gravity system with conduits made from asbestos and locally produced *mara* (mahogany) is an enviable achievement in sanitary engineering skill.

After pleasant hours of speechmaking near the elevated storage tank, a drinking ceremony was held at the village plaza fountain. Saluds were exchanged with the Ministro de Higiene y Salubridad, invited diplomats, and the village sage. With tears in his eyes, the *Amauta* related that his youthful dream of bringing the pure waters of Illampu to his people had at last come true through the kindness of his North American friends.

—GEORGE ADAMS, M.D., M.P.H., *formerly chief of the health, welfare, and housing field party, United States Operations Mission, Bolivia.*

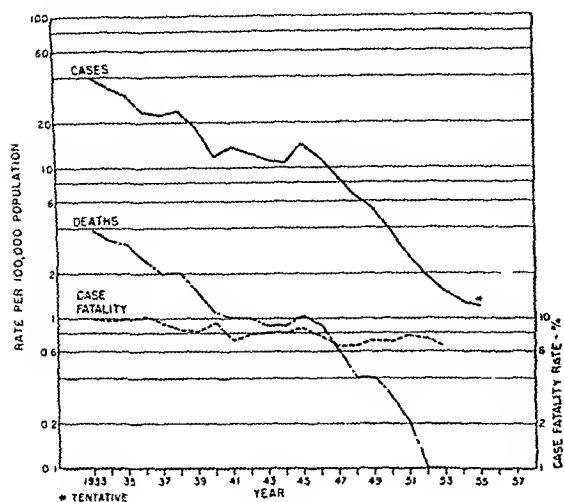
Schistosomiasis

The harvesting of the romaine lettuce crop in Egypt will accelerate the invasion of snails into the Warraq El Arab project area. Snails are particularly fond of romaine lettuce. They quickly attach themselves to the floating leaves, so that the hundreds of stalks, washed daily during early Spring in the Sawahil and Bashtil canals, are likely to disperse aquatic snails throughout an irrigation system.

We have installed palm-leaf snail traps at 100-meter stations along the canals and drains. There are approximately 20 traps to a kilometer. The first dip-net survey of 150 kilometers yielded a small number of *Bulinus truncatus* juveniles, which were treated immediately with sodium pentachlorophenate. Findings from the first examination of the snail traps will determine our course of action.

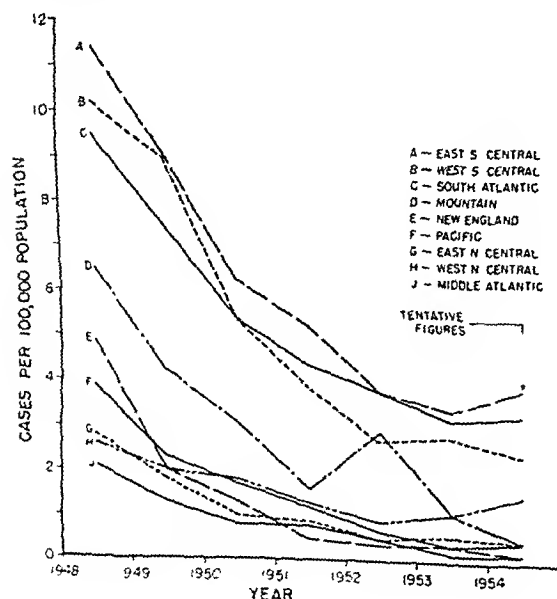
—ANTHONY DONOVAN, M.D., *chief, Health and Sanitation Division, United States Operations Mission, Egypt.*

Figure 1. Reported case rates, death rates, and case fatality rates for diphtheria in the United States, 1933-55.



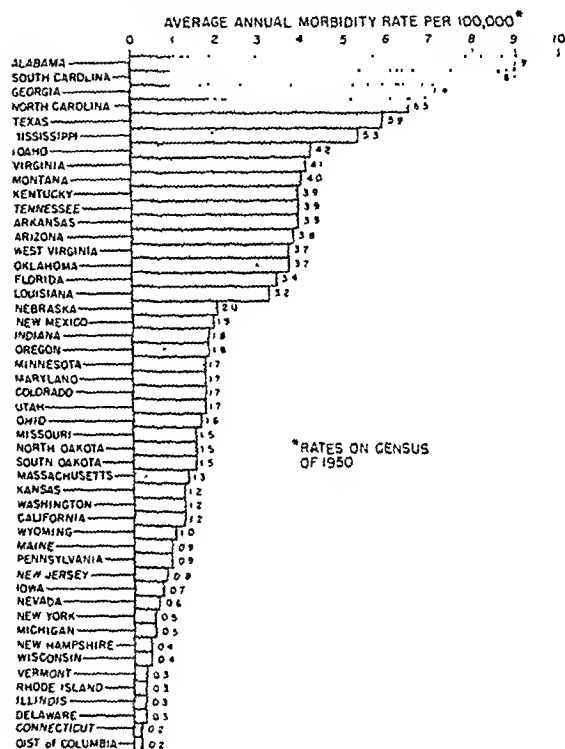
Comparison of death rates for individual States in the same order shows considerable irregularity in death rates from diphtheria, due to variations in case fatality rates (fig. 4). Apparently, diphtheria has not been unduly fatal in the States with the highest case rates; in general, diphtheria fatality rates are as high

Figure 2. Reported diphtheria cases per 100,000 population in the United States, by major geographic division, 1949-55.



or higher in all other parts of the country. Unexpectedly high rates, based on significant numbers of cases and deaths, are encountered in Washington, Oregon, and California, where diphtheria is occurring in adults. On the other hand, the high rates recorded for Vermont, Connecticut, and the District of Columbia are based on extremely small numbers and have little significance.

Figure 3. Diphtheria case rates in the United States, by State, 1950-54.



The State of Idaho is distinguished by a low mortality rate and a very low diphtheria case fatality rate. A large proportion (87 of 126) of the diphtheria cases for the 5 years 1950-54 were reported from a localized outbreak in 1953. During the outbreak, heightened awareness of diphtheria undoubtedly stimulated diagnostic activity and the reporting of mild cases which might have escaped detection at other times. Also, the public health and community resources of the area were completely mobilized to combat the disease. It would be much too cynical to attribute this low fatality rate entirely to

1945 (fig. 1, table 1). In distinct contrast is the case fatality rate, which remains at 6 to 7 percent. Neither advances in the quality and availability of medical care nor the effect of immunization has been reflected in a lowered fatality rate for diphtheria. Any improvement has been offset by other adverse factors or by a failure to detect and report nonfatal cases.

The decline in case rates has not been equal and simultaneous in all areas of the United States. Recent case rates for major geographic divisions are shown in figure 2. Rates in the South Atlantic, East South Central, and West South Central States have been noticeably higher than in other geographic divisions; between 1950 and 1954, 69.6 percent of the diphtheria cases in the country occurred in these areas. A slight exception to the general pattern occurred in 1953, when an outbreak of diphtheria in Idaho elevated the case rate for the Mountain States.

This concentration of diphtheria cases in the

southern States has been developing since about 1930. In 1936 Dauer (7) noted that diphtheria mortality in these States had declined only 40 percent between 1918-22 and 1928-32, whereas in the northern and western States the decline had been 60 to 70 percent. In the earlier period the highest rates were recorded in the North Atlantic and East North Central States; in the later period the East South Central and West South Central States had rates almost twice as high as those areas previously at the top of the list. In the years since 1932 rates throughout the country have fallen farther but the north-south difference has remained prominent.

Experience of States

During the period 1950-54 all of the southern States had annual diphtheria case rates higher than 2.3 per 100,000, the average annual rate for the United States (fig. 3). In Alabama and South Carolina the rates were almost four times the national average.

Table 1. Reported diphtheria cases and deaths, United States, 1933-55

| Year | Population (in thousands) | Number | | Rate per 100,000 population | | Case fatality (percent: deaths/ cases) |
|-------------------------|------------------------------|--------------------|---------------------|--------------------------------|-------|--|
| | | Cases ¹ | Deaths ¹ | Case | Death | |
| 1933..... | 125, 579 | 50, 462 | 4, 937 | 40. 1 | 3. 9 | 9. 8 |
| 1934..... | 126, 374 | 43, 156 | 4, 159 | 34. 1 | 3. 3 | 9. 6 |
| 1935..... | 127, 250 | 39, 226 | 3, 901 | 30. 8 | 3. 1 | 9. 9 |
| 1936..... | 128, 053 | 30, 018 | 3, 065 | 23. 4 | 2. 4 | 10. 2 |
| 1937..... | 128, 825 | 28, 536 | 2, 637 | 22. 1 | 2. 0 | 9. 2 |
| 1938..... | 129, 825 | 30, 508 | 2, 556 | 23. 5 | 2. 0 | 8. 4 |
| 1939..... | 130, 880 | 24, 053 | 1, 997 | 18. 3 | 1. 5 | 8. 3 |
| 1940..... | 131, 936 | 15, 536 | 1, 457 | 11. 8 | 1. 1 | 9. 4 |
| 1941..... | 133, 058 | 17, 987 | 1, 293 | 13. 5 | 1. 0 | 7. 2 |
| 1942..... | 133, 752 | 16, 260 | 1, 273 | 12. 4 | 1. 0 | 7. 8 |
| 1943..... | 133, 971 | 14, 811 | 1, 196 | 11. 1 | . 9 | 8. 0 |
| 1944..... | 132, 622 | 14, 150 | 1, 145 | 10. 7 | . 9 | 8. 0 |
| 1945..... | 132, 137 | 18, 689 | 1, 598 | 14. 1 | 1. 2 | 8. 5 |
| 1946..... | 139, 893 | 16, 354 | 1, 259 | 11. 6 | . 9 | 7. 7 |
| 1947..... | 143, 375 | 12, 405 | 799 | 8. 6 | . 6 | 6. 4 |
| 1948..... | 146, 045 | 9, 610 | 634 | 6. 6 | . 4 | 6. 6 |
| 1949..... | 148, 558 | 8, 027 | 574 | 5. 4 | . 4 | 7. 2 |
| 1950..... | 151, 228 | 5, 931 | 410 | 3. 9 | . 3 | 6. 9 |
| 1951..... | 153, 383 | 3, 983 | 302 | 2. 6 | . 2 | 7. 6 |
| 1952..... | 155, 767 | 2, 960 | 217 | 1. 9 | . 1 | 7. 3 |
| 1953..... | 158, 320 | 2, 355 | 156 | 1. 5 | . 1 | 6. 6 |
| 1954..... | 161, 183 | 2, 041 | ----- | 1. 3 | ----- | ----- |
| 1955 ² | 164, 280 | 2, 039 | ----- | 1. 2 | ----- | ----- |

¹ Cases and deaths for death-registration States. Registration complete in 1933.

² Tentative figures.

SOURCE: Cases, 1933-55, The Notifiable Diseases; 1955 cumulated weekly reports. Deaths, 1933-55, Annual Summary, Vital Statistics of the United States, National Office of Vital Statistics.

Table 2. Diphtheria outbreaks in the United States, 1955

| State | County | Cases | | Date | Remarks |
|----------------|-------------|-------------|--------------------|-------------------|--|
| | | Num- ber | Rate ¹ | | |
| Minnesota | Beltrami | 13 | 52.1 | January-February | Rural white population. 5 of 13 cases were in adults. ² |
| South Dakota | Charles Mix | 14 | 90.0 | March-April | Rural white population. 8 of 24 cases were in adults. ² 76 percent of school children and 46 percent of preschool children currently and adequately immunized; 38-67 percent of adults Schick positive. |
| Kentucky | Meade | 24 | 254.8 | April-June | |
| Alabama | Russell | 37 | 91.7 | July-August | Rural and urban nonwhite populations. |
| South Carolina | Charleston | 99 | 44.7 | July-November | Rural and urban nonwhite populations. |
| James Island | | 52 | ³ 776.2 | July-October | Focus of outbreak was on a coastal island, not in the city of Charleston. 50 percent of school children and 42 percent of preschool children adequately immunized. |
| Alabama | Dallas | 17 | 30.2 | July-October | Rural nonwhite population. 11.5 percent of nonwhite school children currently and adequately immunized but 84 percent Schick negative. |
| South Carolina | Dillon | 10 | 32.3 | August-October | |
| Alabama | Pike | 11 | 35.9 | August-November | |
| South Carolina | Georgetown | 12 | 37.8 | September | |
| Georgia | Sumter | 17 | 70.2 | | |
| Alabama | Sumter | 16 | 67.8 | | |
| North Carolina | Hoke | 11 | 69.8 | | |
| Georgia | Harris | 13 | 115.4 | October-November | |
| Georgia | Dougherty | 10 | 22.9 | October-December | Primarily in the Latin-American population. Primarily in the city of Omaha. |
| Texas | Cameron | 56 | 44.7 | October-December | |
| Texas | Hidalgo | 38 | 23.7 | October-December | |
| Nebraska | Douglas | 63 | 22.4 | October-December | |
| Alabama | Tuscaloosa | 27 | 28.7 | November-December | |
| Florida | Lee | 10 | 42.7 | November-December | |

¹ Per 100,000 of county population, census of 1950.
² 25 years of age and over.

³ Per population of census area, 1950.

tion or higher, on an annual basis. We are fully aware that this definition may exclude a fairly sharp localized outbreak in an institution or neighborhood which would not lead to a rate of 20 per 100,000 in a populous county. This rate should be a departure from the rate usually observed in the county in recent years.

With this definition, 19 outbreaks of diphtheria occurred in 1955. They are shown by order of occurrence in table 2, together with some observations by field personnel of the Communicable Disease Center.

The wide geographic distribution of these episodes, from upper Minnesota to lower Florida and Texas, is noteworthy, as well as

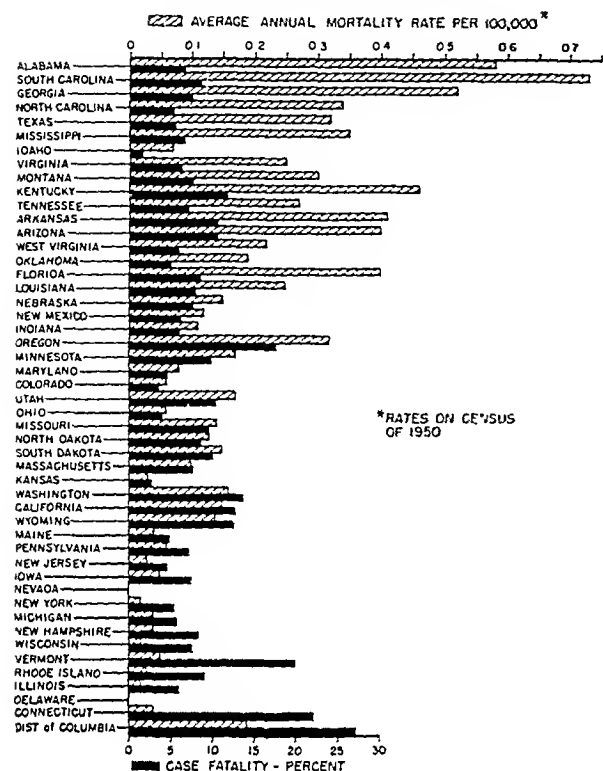
the wide distribution with respect to the calendar. The populations affected were found to be quite diverse wherever information on diphtheria outbreaks was obtained.

Summary

1. While diphtheria case rates and death rates have decreased in recent years, the case fatality rate has changed little. A need to inquire into the promptness of diagnosis and the completeness of reporting is suggested.

2. The persistent diphtheria problem in the United States is tending to localize in the South Atlantic, East South Central, and West South Central States.

Figure 4. Diphtheria death rates in the United States, by State, 1950-54.



“over-reporting” of nonfatal cases. Conversely, one might hold that, given the same degree of alertness, a case fatality rate of 1.6 percent is achievable almost anywhere.

Distribution of Diphtheria in 1955

In 19 of the first 26 weeks of 1955, the weekly incidence of diphtheria was the same as or lower than that of 1954, and the total of reported cases at midyear was 717 as compared with 872 cases in the same period of 1954. Incidence was well below the 5-year median (fig. 5), with the exception of the first week in January. The seasonal low was reached about the fourth week in July.

The diphtheria season began early in August with a fairly sharp outbreak in Alabama, followed almost immediately by an episode in South Carolina, which continued throughout the autumn. During August and September reported cases exceeded the 5-year median on several occasions.

A sharp peak in incidence of diphtheria is

noted in November and early December, when an outbreak was in progress in Nebraska. At the same time, two counties in Texas and two in Alabama reported an undue number of cases. This combination, added to the usual seasonal increases, produced the sharp peak in the 48th and 49th weeks of 1955.

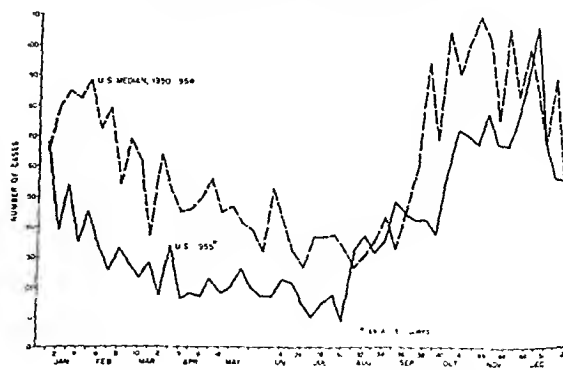
During the latter half of the year, 1,327 cases (tentative) were reported, an excess of 110 over the same period in 1954. The number of currently reported cases exceeded the 5-year median in 5 of the last 26 weeks.

In 1955, reported diphtheria cases were concentrated in the southern States (8). When this distribution is displayed as rates, the pattern is the same as that which has been seen quite consistently in recent years (fig. 6). The relatively high rates in South Dakota and Nebraska are attributable to localized sharp outbreaks. In almost every year some State in the northern and western areas has such an experience. The same State is not usually affected in 2 successive years.

Outbreaks in 1955

There is no standard numerical definition of a diphtheria “outbreak.” Therefore, to facilitate discussion of the areas where the prevalence of diphtheria was considerably different from prevalence of the disease in the country as a whole, an arbitrary definition has been chosen. For convenience, and to suit the present low incidence of the disease, “outbreak” here indicates 10 or more cases in a county, producing a county rate of 20 per 100,000 popula-

Figure 5. Reported diphtheria cases in the United States, by week, 1955.



Mortality Experience Among the Japanese in the United States, Hawaii, and Japan

TAVIA GORDON

MORTALITY among the Japanese in continental United States is similar in many respects to that among the white population. However, mortality from the chronic diseases, particularly the cardiovascular diseases, presents some striking contrasts. In comparison with the white population, the death rates for diseases of the heart are quite low, while those for vascular lesions affecting the central nervous system are rather high. The same differential, but in a more exaggerated form, is evident among the Japanese in Hawaii and for Japan itself.

A more complete description of mortality among Americans of Japanese birth or descent in continental United States follows. This description is based on unpublished data for the years 1949-52 from the National Office of Vital Statistics of the Public Health Service. For comparison, data are also presented for the Japanese in Hawaii (1-3) and for Japan (4, 5), as well as for the white population of continental United States (6). In addition, some historical and demographic material, enough, it is hoped, to place the main body of data in perspective, is included.

The data described in this paper are not, of course, appropriate for disentangling the various genetic and cultural factors that may affect the mortality experience of these various groups, and they should not be taken as doing that. Furthermore, there is usually some uncertainty about the certification of cause of

death, especially for the chronic diseases. When the mortality data of different groups are compared, as in this paper, the shadow of doubt may be rather large. Nevertheless, mortality data can provide a groundwork for a more direct inquiry into causative factors. In any event, they are of interest in themselves.

Demographic Characteristics

In the United States in 1950, the Japanese were primarily city dwellers (7). Some 71 percent of all Japanese in this country were urban residents, most of them living within a few metropolitan areas. Yet, almost a third of all employed Japanese men (some of them nominally urban residents of the Los Angeles metropolitan area) were classified to the major occupation groups of farmers, farm managers, farm laborers, or farm foremen.

Geographically, the Japanese were concentrated on the west coast. Nearly 60 percent lived in California and 27 percent lived in the Los Angeles metropolitan area in 1950.

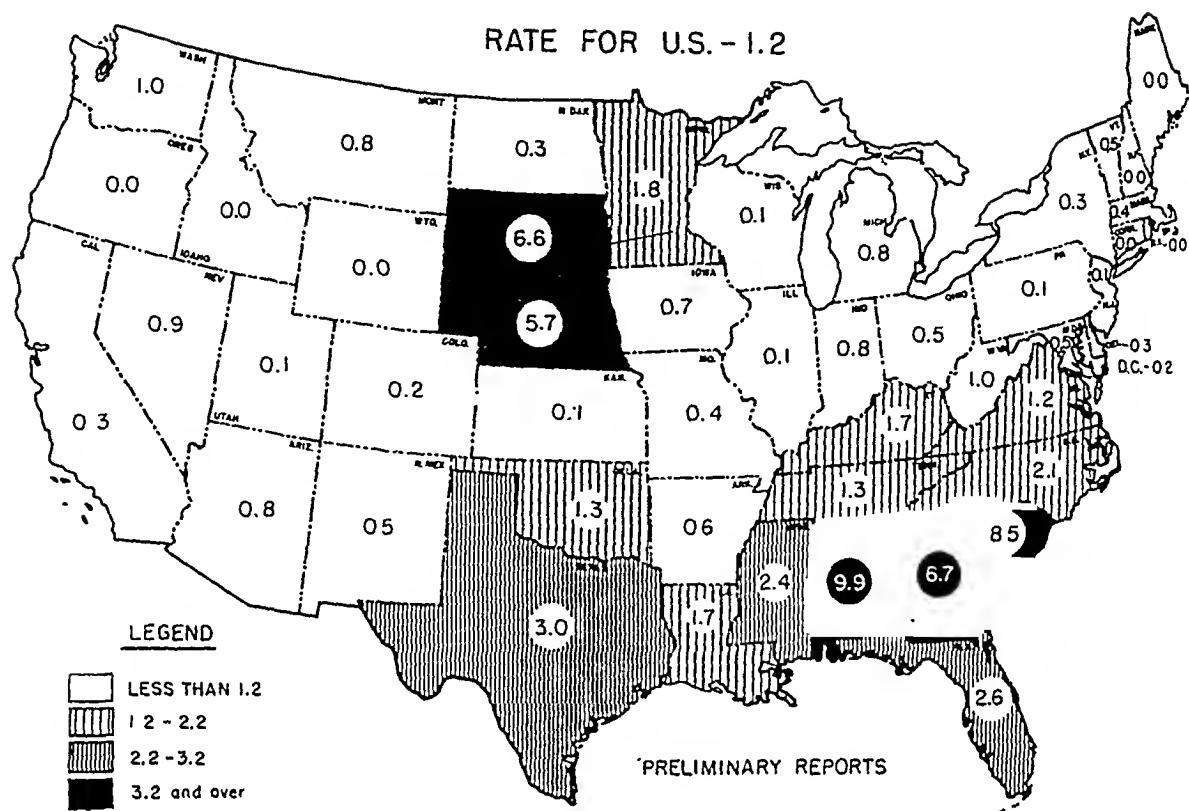
The level of education among the Japanese in the United States, in terms of number of school years completed, was above average. In comparison with the white population, their median income was low, they tended to marry later, and a larger proportion were single. There were more Japanese men than Japanese women in the United States, especially at the older ages. More than one-fourth of all Japanese Americans were born in Japan.

General Mortality

The mortality experience of the Japanese in the United States may be described as favorable.

Mr. Gordon is a statistician on the staff of the National Heart Institute, National Institutes of Health, Public Health Service.

Figure 6. Reported diphtheria cases per 100,000 population in the United States, by State, 1955.



3. Outbreaks of diphtheria have been observed in these areas but not exclusively so. Localized sharp outbreaks have occurred in recent years in Idaho, Nebraska, Minnesota, South Dakota, and other northern and western States.

4. During 1955, outbreaks of diphtheria were observed in diverse regions and in all months of the year. The populations affected were variously white, nonwhite, and Latin-American. Both rural and urban areas were involved.

• • •

Tables giving the reported diphtheria cases in the United States and the rate per 100,000 population, for major geographic divisions, 1949-55, and for each State, 1950-54, are available from Dr. Moore.

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Table 2. Average death rates¹ for selected causes by sex for specified age groups: Japanese in continental United States, 1949-1952

| Cause of death ² | Males, by age group ³ | | | | Females, by age group ⁴ | | | |
|--|----------------------------------|-------|---------|---------|------------------------------------|-------|-------|---------|
| | 35-44 | 45-54 | 55-64 | 65-74 | 35-44 | 45-54 | 55-64 | 65-74 |
| All causes----- | 293.0 | 711.5 | 1,760.9 | 4,077.2 | 250.6 | 487.1 | 985.5 | 2,536.2 |
| Tuberculosis, all forms (001-019)----- | 29.3 | 70.4 | 142.5 | 253.9 | 35.8 | 22.0 | 13.9 | 40.3 |
| Infective and parasitic diseases (020-138)----- | 0 | 7.8 | 32.9 | 50.1 | 0 | 3.7 | 4.6 | 26.8 |
| Malignant neoplasms (140-205)----- | 43.9 | 160.3 | 427.4 | 976.4 | 71.6 | 124.5 | 357.9 | 469.7 |
| Diabetes mellitus (260)----- | 0 | 3.9 | 40.2 | 57.2 | 0 | 7.3 | 4.6 | 53.7 |
| Vascular lesions affecting CNS (330-334)----- | 22.0 | 54.7 | 230.2 | 579.4 | 22.4 | 106.2 | 199.9 | 496.5 |
| Diseases of heart (410-443)----- | 73.2 | 199.4 | 562.6 | 1,291.1 | 22.4 | 106.2 | 237.1 | 1,006.4 |
| Chronic rheumatic heart disease (410-416)----- | 3.7 | 7.8 | 3.7 | 32.2 | 0 | 7.3 | 13.9 | 26.8 |
| Arteriosclerotic and degenerative heart disease (420-422)----- | 51.3 | 152.5 | 464.0 | 1,083.7 | 17.9 | 47.6 | 153.4 | 711.2 |
| Other diseases of heart (430-434)----- | 7.3 | 7.8 | 11.0 | 21.5 | 0 | 7.3 | 0 | 26.8 |
| Hypertension with heart disease (440-443)----- | 11.0 | 31.3 | 84.0 | 153.8 | 4.5 | 43.9 | 69.7 | 241.5 |
| Hypertension without mention of heart (444-447)----- | 0 | 3.9 | 3.7 | 28.6 | 4.5 | 3.7 | 9.3 | 13.4 |
| Influenza and pneumonia (480-493)----- | 3.7 | 3.9 | 43.8 | 107.3 | 0 | 11.0 | 27.9 | 67.1 |
| Bronchitis (500-502)----- | 0 | 0 | 0 | 7.2 | 0 | 0 | 0 | 0 |
| Ulcer of stomach and duodenum (540,541)----- | 0 | 15.6 | 7.3 | 89.4 | 0 | 3.7 | 9.3 | 26.8 |
| Gastritis, etc. (543, 571, 572)----- | 3.7 | 0 | 7.3 | 10.7 | 0 | 0 | 0 | 0 |
| Cirrhosis of liver (581)----- | 7.3 | 23.5 | 14.6 | 60.8 | 4.5 | 0 | 4.6 | 13.4 |
| Nephritis and nephrosis (590-594)----- | 14.6 | 27.4 | 14.6 | 25.0 | 4.5 | 22.0 | 27.9 | 26.8 |
| Symptoms, senility, and ill-defined conditions (780-795)----- | 0 | 0 | 3.7 | 17.9 | 4.5 | 0 | 0 | 0 |
| Accidents and violence (E810-E999)----- | 69.6 | 97.7 | 142.5 | 225.3 | 49.2 | 43.9 | 41.8 | 93.9 |
| All other----- | 25.6 | 43.0 | 87.7 | 296.8 | 31.3 | 33.0 | 46.5 | 201.3 |

¹ Rates per 100,000 population in each specified group as of April 1, 1950.

² Numbers after causes are category numbers of the sixth revision of the International Lists, 1948.

³ Total numbers of deaths for specified age groups were: 80, 182, 482, 1,140.

⁴ Total numbers of deaths for specified age groups were: 56, 133, 212, 189.

NOTE: For more detailed data on causes of death, see Documentation Note at end of the paper.

born in Japan to return home to pass their later years. It is conceivable that this is a selective process that would affect death rates in the United States, either raising them or lowering them. Lacking data on this score, it is impossible to be certain, but, in any event, this process would probably have less effect on the rates around 1950 than at earlier periods.

It is worth noting that the generally favorable mortality experience for the Japanese in the United States is nothing new. Although there were naturally some differences in detail, mortality for this group was relatively low in 1940 and in 1930. Were this not the case, the small size of the Japanese population in the United States, and consequently the small number of deaths reported, might raise some doubts, on grounds of the variability of small numbers, with respect to the reported death rates. As it is, there is little question that the death rates

give a generally reliable indication of the force of mortality in the Japanese population.

Deaths by Cause

For some causes of death, experience among the Japanese in the United States (table 2) is similar to that among the white population. Maternal mortality is low: There were only 11 deaths from maternal causes among the Japanese in 1949-52 while births in that period numbered 15,224. Few deaths were reported for the infectious diseases, with the exception of tuberculosis. Mortality from influenza and pneumonia was very similar to the mortality from those causes reported for the white population. Syphilis mortality is apparently comparable, although the number of deaths reported for the Japanese was too low for precise comparison.

Specifically, that means that death rates among the Japanese are lower than among the white population. This may be seen from table 1, which gives death rates by age and sex for the two populations. With two minor exceptions, for boys 5-14 years and women 35-44 years, age-specific death rates are lower among the Japanese of both sexes than among the whites.

Missing from this picture is the infant mortality rate, a historic index of public hygiene and medical care. In 1950, 19.1 Japanese infants died for every 1,000 born, a rate found only in well-favored white groups. The rate for the white population as a whole was 26.8.

These comparisons are between the white population and the Japanese population throughout the continental United States. It will be recognized, however, that the Japanese population tends to concentrate in certain local-

ities and in certain occupation groups, and, indeed, that it differs from the white population in a number of demographic characteristics. If the comparisons could be restricted to the specific areas where the Japanese reside or to a white population with demographic characteristics similar to the Japanese, the mortality differentials might possibly be somewhat reduced. It is unlikely, however, that they would be reduced very much. Actually, it is possible that the specific differentials are understated: The age-specific death rates for the white population of California, the State where the largest proportion of the Japanese American population is concentrated, were in general above those for the white population of all the States in 1950.

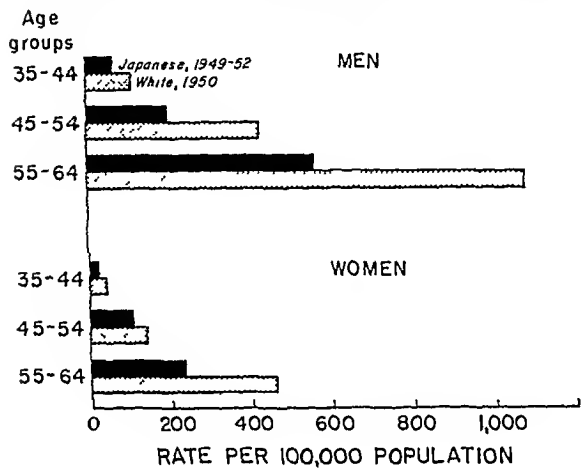
There is one demographic factor that warrants special mention. This is the tendency, especially in earlier decades, for the Japanese

Table 1. Number of deaths and death rates for white and Japanese populations of continental United States, Japanese of Hawaii, and Japan, by age and sex, for specified years

| Age group (years) | Males | | | | Females | | | |
|-----------------------------------|------------------------------|--------------------|----------------|-------------------------------------|------------------------------|--------------------|----------------|-------------------------------------|
| | Japanese | | | White, United States, 1950 | Japanese | | | White, United States, 1950 |
| | United States, 1949-52 | Hawaii, 1949-51 | Japan, 1951 | | United States, 1949-52 | Hawaii, 1949-51 | Japan, 1951 | |
| Number of deaths | | | | | | | | |
| All ages..... | 2, 749 | 1, 928 | 432, 517 | 731, 366 | 916 | 1, 070 | 406, 449 | 544, 719 |
| 0-4..... | 183 | 171 | 107, 800 | 55, 516 | 151 | 126 | 94, 699 | 40, 705 |
| 5-14..... | 29 | 26 | 13, 327 | 7, 298 | 14 | 25 | 12, 200 | 4, 704 |
| 15-24..... | 45 | 47 | 22, 972 | 14, 769 | 35 | 32 | 20, 979 | 7, 024 |
| 25-34..... | 95 | 73 | 23, 139 | 19, 323 | 61 | 54 | 25, 533 | 12, 235 |
| 35-44..... | 80 | 63 | 25, 828 | 36, 293 | 56 | 61 | 24, 743 | 22, 915 |
| 45-54..... | 182 | 141 | 39, 877 | 77, 150 | 133 | 114 | 29, 695 | 42, 994 |
| 55-64..... | 482 | 321 | 62, 285 | 142, 419 | 212 | 179 | 44, 532 | 79, 803 |
| 65 and over..... | 1, 653 | 986 | 137, 289 | 378, 003 | 254 | 479 | 154, 068 | 334, 016 |
| Death rate per 100,000 population | | | | | | | | |
| All ages..... | 898. 9 | 653. 5 | 1, 042. 4 | 1, 089. 5 | 352. 8 | 390. 4 | 943. 5 | 803. 3 |
| 0-4..... | 626. 0 | 503. 8 | 1, 805. 7 | 766. 3 | 524. 6 | 389. 3 | 1, 651. 5 | 586. 5 |
| 5-14..... | 73. 8 | 51. 0 | 146. 6 | 67. 2 | 38. 2 | 50. 8 | 137. 6 | 45. 1 |
| 15-24..... | 86. 9 | 88. 6 | 276. 9 | 152. 4 | 70. 3 | 55. 3 | 254. 0 | 71. 5 |
| 25-34..... | 132. 7 | 135. 4 | 429. 8 | 185. 3 | 94. 9 | 94. 8 | 401. 0 | 112. 8 |
| 35-44..... | 293. 0 | 199. 3 | 555. 9 | 380. 9 | 250. 6 | 213. 1 | 483. 7 | 235. 8 |
| 45-54..... | 711. 5 | 695. 8 | 1, 055. 8 | 984. 5 | 487. 1 | 535. 2 | 803. 4 | 516. 4 |
| 55-64..... | 1, 760. 9 | 1, 890. 1 | 2, 428. 3 | 2, 304. 4 | 985. 5 | 1, 126. 4 | 1, 695. 2 | 1, 293. 8 |
| 65 and over..... | 4, 912. 6 | 5, 207. 8 | 7, 791. 7 | 7, 051. 9 | 2, 804. 8 | 4, 060. 7 | 6, 379. 6 | 5, 554. 6 |

the white population over the rate for the Japanese is larger than the reported rate for malignant neoplasms, which are the major non-cardiovascular cause of death in these age groups. The excess is also larger than the rate for the large group of causes classified as "all other" in figures 1 and 7.

Figure 2. Death rates by age and sex for diseases of the heart: Japanese and white populations of continental United States.



There does not appear to be any way of closing the large gap between the cardiovascular rates for the two groups by shifting assignments of cause of death. Such reassignment would either result in reducing death rates for the noncardiovascular causes to implausible levels for the Japanese or in increasing the rates for the noncardiovascular causes to equally implausible levels for the whites. It seems clear that cardiovascular mortality, especially for adult men, is really substantially lower among the Japanese population of the United States than among the white.

When the cardiovascular diseases are examined in detail, the differences are seen to arise from diseases of the heart, with death rates for this cause much lower for Japanese than for whites (fig. 2). Death rates for vascular lesions affecting the central nervous system are actually somewhat higher among the Japanese (fig. 3). Indeed, for Japanese women aged 45-54 the death rate for this cause more than compensates for the low death rate for diseases of the heart so that the total cardiovascular

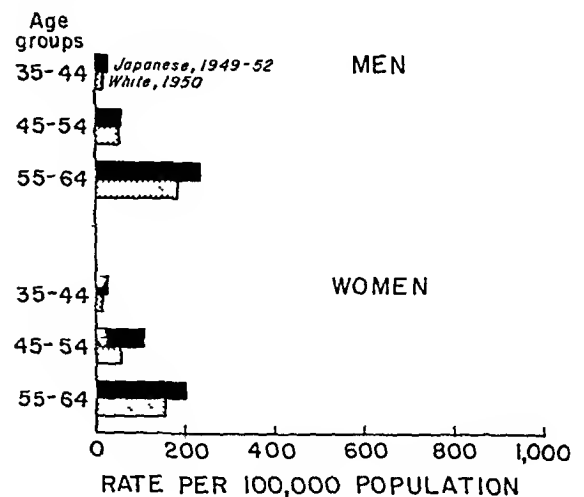
death rate is slightly higher than for white women of this age group.

Again, it is conceivable that there is a difference in medical certification between the two groups; but if there is, the corollary evidence would suggest an understatement in the death rate for vascular lesions affecting the central nervous system for the white population, since the death rates for the residual cause groups are larger in the white population than in the Japanese. It may be noted in this connection that the white American has higher death rates for "symptoms, senility, ill-defined conditions" (a cause group into which a fair number of cardiovascular deaths might be classified if certification is poor) than does the Japanese American. However, the death rate for these causes is not high enough in either group to affect seriously the comparisons.

Japanese in Hawaii and Japan

Some of the characteristics of mortality that distinguish the Japanese population from the white population in the continental United States are paralleled in Hawaii and in Japan (table 3 and figs. 4, 5, 6, and 7). The death rates among Japanese men for diseases of the heart are low in the United States, even lower in Hawaii, and much lower in Japan. For

Figure 3. Death rates by age and sex for vascular lesions affecting the central nervous system: adult Japanese and white populations of continental United States.



For other causes of death, mortality among the Japanese of the United States differs significantly from that for the white population. The Japanese have a somewhat lower accident mortality, except in childhood. Homicide is a negligible cause of death; only 4 Japanese died from this cause during 1949-52. Suicide, on the other hand, looms larger among the Japanese. While suicide rates for Japanese men are very like those for white men, the rates for Japanese women are well above those for white women, especially in the age groups 35 and over.

It is in the area of the chronic diseases, however, that the contrast between mortality for the Japanese of the United States and for the white population is most striking. Deaths from diabetes are uncommon among Japanese women in the United States in contrast to mortality from this cause among white women. On the other hand, tuberculosis mortality is higher among the Japanese than the white population, although not nearly so high as for Negroes. Although death rates for malignant neoplasms are similar in the white and Japanese groups,

there are differences in rates for the various sites (8).

Cardiovascular Diseases

Among the chronic diseases, the cardiovascular diseases provide the most dramatic contrast. Figures 1 and 7 show the large differentials between the Japanese and white populations of the United States in mortality from diseases of the cardiovascular system. In these graphs cardiovascular mortality is presented in the context of the total mortality for each of the specific age groups. Death rates for the cardiovascular diseases are presented to the left of the origin, and death rates for other causes, divided into tuberculosis (all forms), malignant neoplasms, accidents and violence, and "all other," are presented to the right.

Death rates for the noncardiovascular causes as a whole tend to be a little lower for the Japanese than for the white population of the United States. For men aged 45 through 74, the excess of the cardiovascular death rate for

Figure 1. Death rates by age and sex for major components of mortality: adult Japanese and white populations of continental United States.

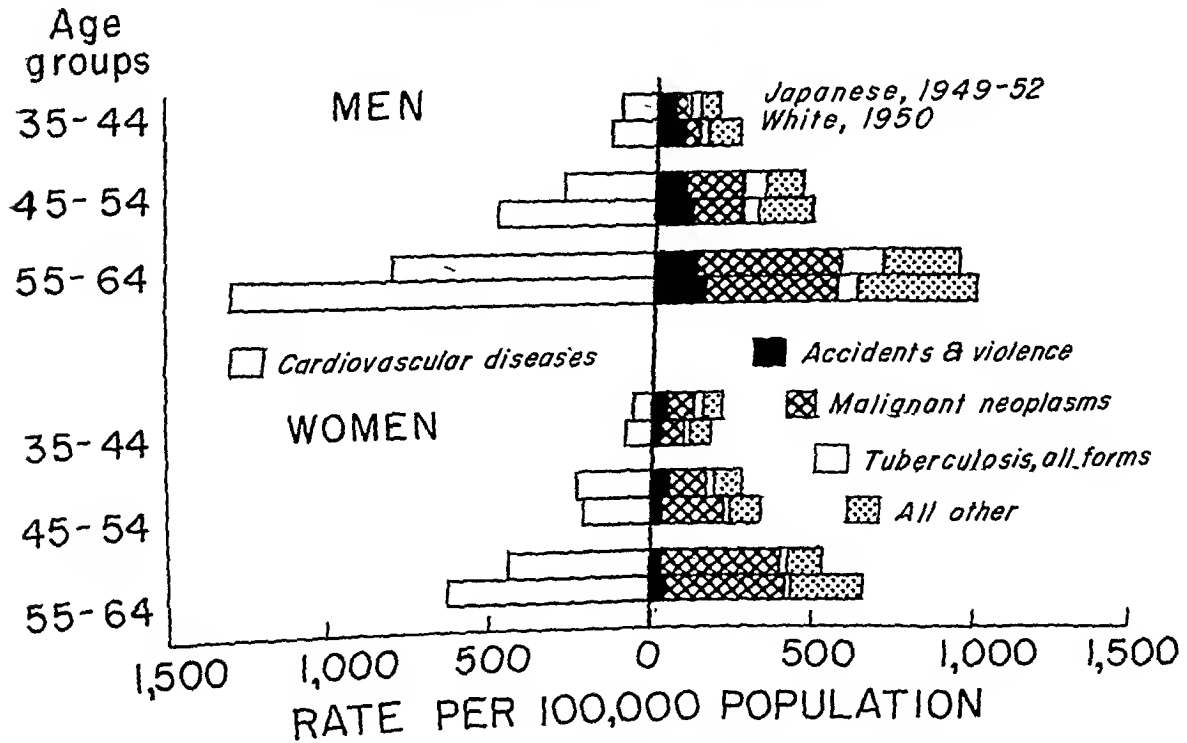
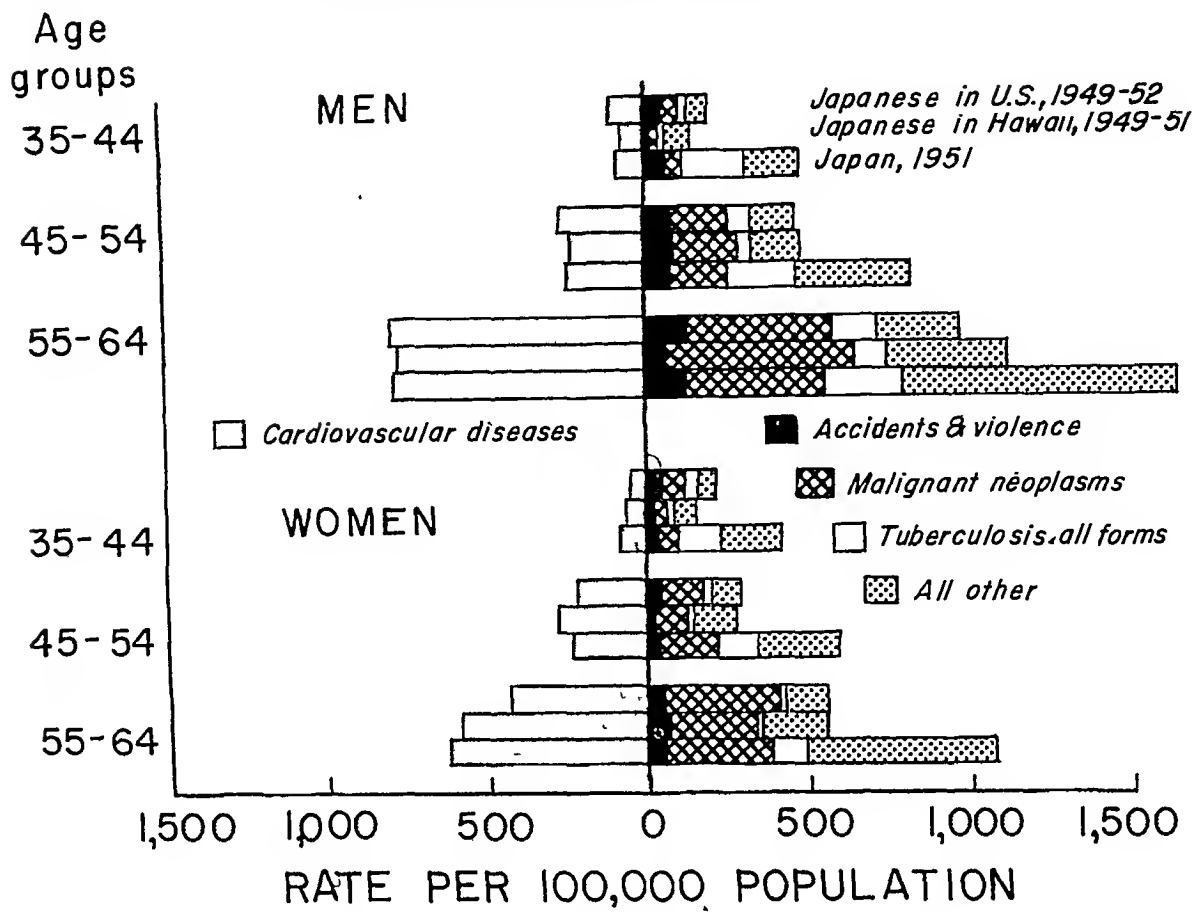


Figure 4. Death rates by age and sex for major components of mortality: adult Japanese in continental United States, Hawaii, and Japan.



enza and pneumonia, bronchitis, cirrhosis of the liver, and nephritis and nephrosis. There are, in short, a number of diseases tending to raise mortality among adults to a higher level in Japan than in the United States or in Hawaii. Nevertheless, the total death rates for men 45-54 and 55-64, unlike the death rates for men 35-44 or 65-74 and unlike the death rates for adult women at any age, are nearly as high in the white population of the United States as in Japan. This presumably reflects the unusual hazard from heart disease encountered by the white, male, middle-aged American.

It ought to be noted at this point that a relatively few areas in Japan supplied the bulk of the migrants to Hawaii and to the United States. Exact data on this subject are not available, but it appears that the main sources of migration, notably Hiroshima prefecture,

were the same for Hawaii and for the United States. (This conclusion is based on personal communications from the Japanese consulate general of Hawaii, the Japanese American Citizens League, and Professor Andrew W. Lind, University of Hawaii.) While detailed mortality was not examined for the Japanese prefectures, the prefectures that are reputed to have supplied the largest number of immigrants to the United States and Hawaii differed little from Japan as a whole either in crude death rates or in total death rates for the cardiovascular causes.

Nativity

Insofar as cardiovascular mortality among the Japanese of the United States expresses a cultural difference, the death rate from diseases

Japanese women the picture is less neat, but in general it is one of low death rates for this cause. On the other hand, the death rates for vascular lesions affecting the central nervous system are high among the Japanese of either sex in the United States, are slightly higher in Hawaii, and are much higher in Japan. These antithetic differences pretty well balance out for men, so that the death rates for diseases of the cardiovascular system are very similar for Japanese men in the United States, Hawaii, and Japan; in all instances, they are lower than the rates for white men in the United States.

To put the mortality data for Japan in a historical perspective, death rates for vascular lesions affecting the central nervous system, which were at an exceptionally high level between 1918 and 1942, took an abrupt drop after World War II to about the level they had temporarily assumed between 1910 and 1915 (5). Thus, in 1951, the year we are using for com-

parison, the rates were relatively low. Death rates for diseases of the heart, on the other hand, while they have shown some large fluctuations since 1910, with the expected peak in 1918 during the influenza pandemic, have not shown such abrupt changes as have the rates for vascular lesions affecting the central nervous system and have evidenced little long-term trend. If anything, there has been a slight tendency for the death rates for diseases of the heart in Japan to decline over the years.

Total mortality in Japan itself tends to be rather high. This is due, in part, to the very high death rate for tuberculosis in Japan, a rate which may be regarded as an exaggeration of the high rates for the Japanese in the United States and in Hawaii. To a larger degree, however, the high total mortality in Japan is due to high death rates for some causes that exhibit relatively low death rates among the Japanese in Hawaii and in the United States, in particular to a high mortality from influ-

Table 3. Average death rates¹ for selected causes by sex for specified age groups: Japanese in Hawaii, 1949-1951

| Cause of death ² | Males, by age group ³ | | | | Females, by age group ⁴ | | | |
|---|----------------------------------|-------|---------|---------|------------------------------------|-------|---------|---------|
| | 35-44 | 45-54 | 55-64 | 65-74 | 35-44 | 45-54 | 55-64 | 65-74 |
| All causes | 199.3 | 695.8 | 1,890.1 | 3,987.5 | 213.1 | 535.2 | 1,126.4 | 3,020.9 |
| Tuberculosis, all forms (001-019) | 15.8 | 49.3 | 106.0 | 133.7 | 3.5 | 23.5 | 25.2 | 46.1 |
| Infective and parasitic diseases (020-138) | 3.2 | 0 | 29.4 | 59.4 | 0 | 23.5 | 0 | 11.5 |
| Malignant neoplasms (140-205) | 28.5 | 177.6 | 571.2 | 1,113.8 | 55.9 | 93.9 | 258.0 | 611.1 |
| Diabetes mellitus (260) | 6.3 | 14.8 | 29.4 | 96.5 | 0 | 14.1 | 56.6 | 207.5 |
| Vascular lesions affecting CNS (330-334) | 12.7 | 64.2 | 300.3 | 653.4 | 21.0 | 122.1 | 220.3 | 576.5 |
| Diseases of heart (410-443) | 47.5 | 157.9 | 471.1 | 1,240.1 | 31.4 | 145.5 | 358.7 | 1,118.4 |
| Chronic rheumatic heart disease (410-416) | 6.3 | 9.9 | 5.9 | 14.9 | 10.5 | 14.1 | 25.2 | 23.1 |
| Arteriosclerotic and degenerative heart disease (420-422) | 31.6 | 88.8 | 300.3 | 802.0 | 3.5 | 46.9 | 144.7 | 576.5 |
| Other diseases of heart (430-434) | 0 | 0 | 0 | 7.4 | 0 | 9.4 | 6.3 | 23.1 |
| Hypertension with heart disease (440-443) | 9.5 | 59.2 | 164.9 | 415.8 | 17.5 | 75.1 | 182.5 | 495.8 |
| Hypertension without mention of heart (444-447) | 0 | 4.9 | 11.8 | 37.1 | 10.5 | 4.7 | 6.3 | 23.1 |
| Influenza and pneumonia (480-493) | 0 | 4.9 | 11.8 | 89.1 | 0 | 4.7 | 6.3 | 46.1 |
| Bronchitis (500-502) | 0 | 0 | 0 | 7.4 | 0 | 0 | 0 | 0 |
| Ulcer of stomach and duodenum (540, 541) | 6.3 | 19.7 | 17.7 | 52.0 | 0 | 0 | 6.3 | 0 |
| Gastritis, etc. (543, 571, 572) | 0 | 0 | 0 | 14.9 | 3.5 | 9.4 | 0 | 11.5 |
| Cirrhosis of liver (581) | 6.3 | 9.9 | 58.9 | 37.1 | 3.5 | 4.7 | 6.3 | 34.6 |
| Nephritis and nephrosis (590-594) | 9.5 | 39.5 | 94.2 | 52.0 | 34.9 | 37.6 | 50.3 | 57.7 |
| Symptoms, senility, and ill-defined conditions (780-795) | 3.2 | 4.9 | 11.8 | 29.7 | 3.5 | 0 | 0 | 23.1 |
| Accidents and violence (E810-E999) | 28.5 | 98.7 | 70.7 | 155.9 | 14.0 | 18.8 | 62.9 | 69.2 |
| All other | 31.6 | 49.3 | 106.0 | 215.3 | 31.4 | 32.9 | 69.2 | 184.5 |

¹ Rates per 100,000 population in each specified group as of April 1, 1950.

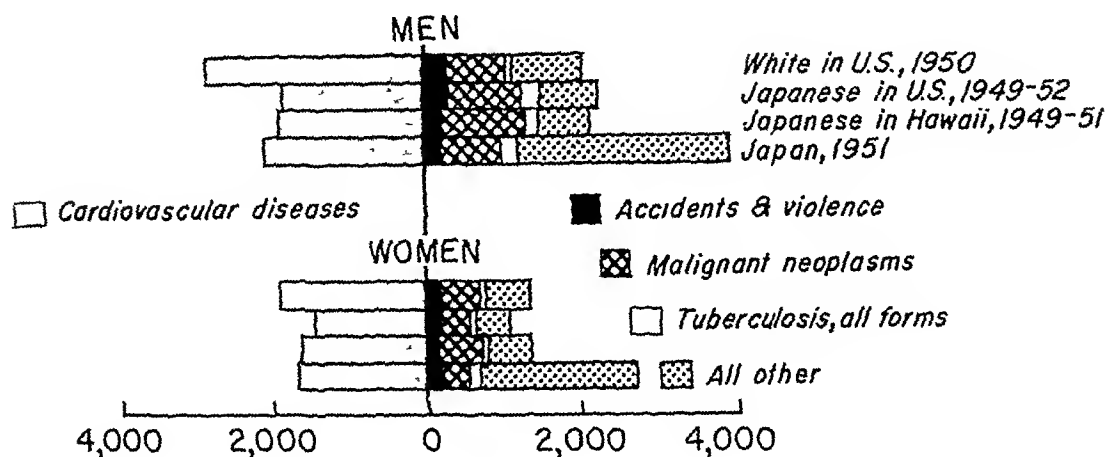
² Numbers after causes are category numbers of the sixth revision of the International Lists, 1948.

³ Total numbers of deaths for specified age groups were: 63, 141, 321, 537.

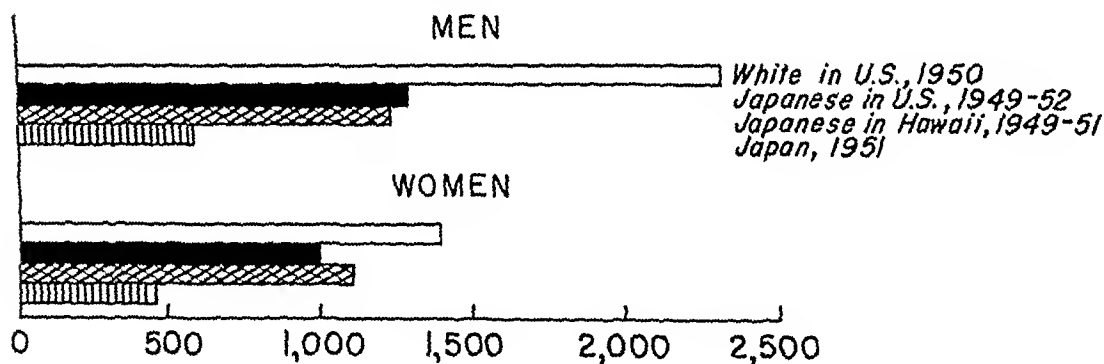
⁴ Total numbers of deaths for specified age groups were: 61, 114, 179, 262.

Figure 7. Death rates for major components of mortality for age group 65-74 years: white and Japanese populations of continental United States, Japanese of Hawaii, and Japan.

Major Components of Mortality



Diseases of Heart



Vascular Lesions of Central Nervous System

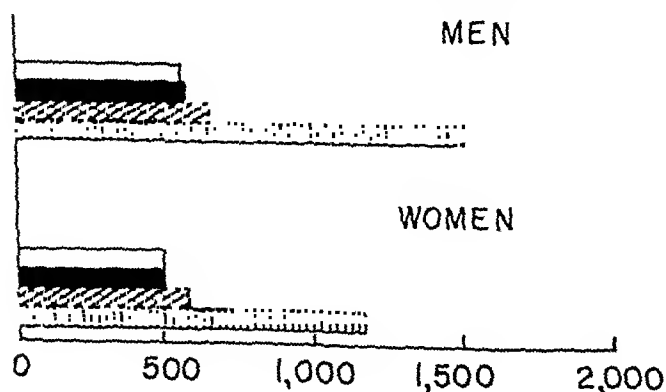
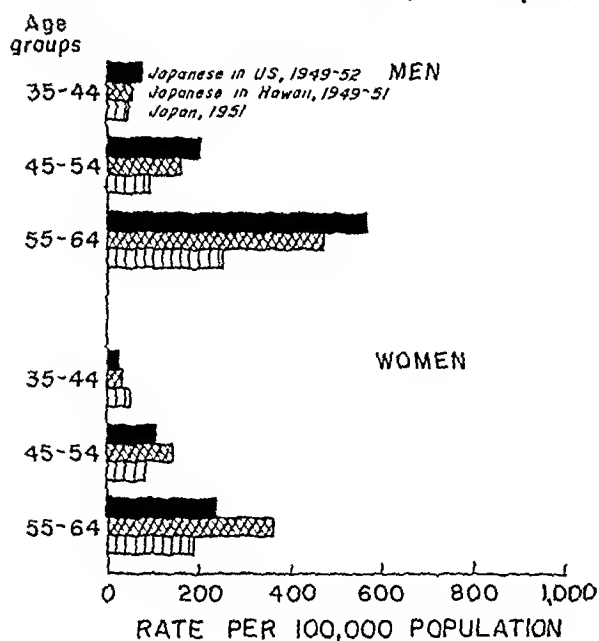


Figure 5. Death rates by age and sex for diseases of the heart: adult Japanese in continental United States, Hawaii, and Japan.



of the cardiovascular system should probably be lower among the foreign-born than among the nisei. Deaths for the Japanese have not been tabulated by nativity, so this possibility cannot be examined directly. An indirect approach is available, however, because of the character of Japanese immigration to the United States. The period of free immigration to the United States was brought to a close in 1911, when the Japanese Government agreed to restrict immigration to the United States and its Territories. (All Asian immigration was stopped in 1924 by an act of Congress and, while Japanese immigration has recently been resumed, it is under very small quotas.)

The effect of this can be seen from the 1950 census data, which give the following percentages of foreign-born Japanese:

| | Age | | | |
|------------------|-------|-------|-------|-------|
| | 25-34 | 35-44 | 45-54 | 55-64 |
| United States--- | 3.2 | 20.1 | 85.8 | 94.7 |
| Hawaii----- | 1.2 | 7.3 | 59.0 | 93.7 |

Thus, one would expect the Japanese population of the United States aged 45-54 to shift from a preponderantly foreign-born one in 1950 to a preponderantly native-born one in 1960. If this is accompanied by a large rise in cardio-

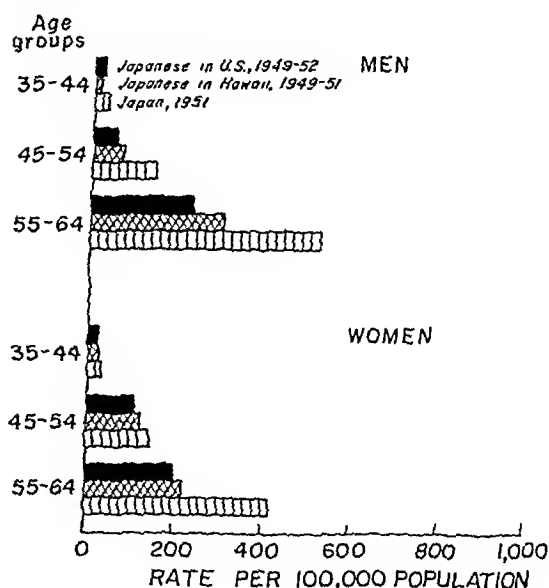
vascular mortality for Japanese men in this age group, and especially by a marked increase in the death rate for diseases of the heart, the inclination will be to attribute the present differentials to cultural factors. If a rise does not occur, it will be much more difficult to reach any kind of conclusion concerning the present differentials. Unfortunately, it is impossible to predict the picture for 1960 even from mortality data for the years since 1952.

Discussion

One interesting feature of these data is the tendency for the Japanese in Hawaii, especially the men, to exhibit an intermediate position with respect to cardiovascular mortality between the Japanese of the United States and Japan. This is true both for diseases of the heart, with the low death rate for the Japanese more marked in Hawaii than in the United States, and for vascular lesions affecting the central nervous system, with higher death rates in Hawaii than in the United States.

The Japanese of Hawaii are apparently closer to the Japanese of Japan than are the Japanese of the United States in something more than a

Figure 6. Death rates by age and sex for vascular lesions affecting the central nervous system: adult Japanese in continental United States, Hawaii, and Japan.



reconciling the mortality data with the medical research data is a major problem for the future.

Summary

In comparison with the death rates among the white population of the United States (1950), the death rates among the Japanese in the United States (1949-52) and in Hawaii (1949-51) are low. Death rates in Japan, however, tend to be higher than those for the white population of the United States.

Death rates for diseases of the heart are quite low among the Japanese, especially the men, in comparison with those for white Americans, whereas rates for vascular lesions affecting the central nervous system are high. For both cause categories, the Japanese of Hawaii tend to occupy an intermediate position between the Japanese of the United States and Japan. The association of a low death rate for diseases of the heart with a high death rate for vascular lesions affecting the central nervous system raises some interesting questions.

DOCUMENTATION NOTE

A tabulation of total deaths and average death rates by age and sex for 64 selected causes among the Japanese population of continental United States, 1949-52, has been deposited as document No. 5203 with the American Documentation Institute, Photoduplication Service, Library of Congress, Washington 25, D. C. A

photoprint copy may be obtained by remitting \$1.25; a 35-mm. microfilm copy by remitting \$1.25. Advance payment is required. Make check or money order payable to Chief, Photoduplication Service, Library of Congress.

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Institute in Social Gerontology

The University of Michigan has recently received a grant of \$203,940 from the National Institutes of Health, Public Health Service, to set up a Training Institute in Social Gerontology. Seventeen universities are cooperating in the project; they are California, Chicago, Connecticut, Cornell, Duke, Florida, Harvard, Illinois, Iowa, Michigan, Minnesota, Pennsylvania State, Pittsburgh, Purdue, Syracuse, Washington (St. Louis), and Wisconsin.

As the first activity, publications will summarize all that is currently known about personal and social problems of human aging. The second phase involves a 1-month training seminar for about 40 faculty members selected by the Inter-University Council from applications submitted through universities and colleges.

geographic sense. It is almost as if some historical process were expressing itself in spatial terms, a common enough phenomenon in the evolution of both cultural and biological forms. It is possible that the changes from Japan to Hawaii to the United States in mortality from diseases of the heart and from vascular lesions affecting the central nervous system represent a parallel to the historic changes in mortality that have apparently taken place within the United States during the 20th century.

Perhaps the most notable characteristic of Japanese mortality is the association of a low death rate for diseases of the heart with a high death rate for vascular lesions affecting the central nervous system. This is not unknown in other mortality statistics; in particular, it is one of the most noteworthy differentials between many of the States of the United States. The first instinct of experts in vital statistics is to appeal to a difference in medical certification in such a case, the classic "reporting artifact." This is a possibility, of course, but against it must be weighed the frequency with which a "stroke" can be recognized and described quite unequivocally. It is difficult to see how, in such instances, a death from a cerebrovascular accident could be confused with a death, especially a sudden death, from coronary artery disease.

This is not to read out the possibility of confusing deaths from the two causes, especially when there has not been a physician in attendance during the illness or at death. In some instances cerebrovascular accidents or symptomatology may occur in the terminal stage of heart disease. Such deaths should be classified to diseases of the heart, but if the preexisting heart disease were unknown or overlooked by the physician, they would be classified to vascular lesions affecting the central nervous system. However, in 1940, the last year for which such data have been compiled, only 7.9 percent of all deaths certified to diseases of the heart in the United States had as an associated cause mentioned on the death certificate "intracranial lesions of vascular origin." This is a minor quantity in relation to the differences between the Japanese of Japan and the white American (or, for that matter, between Japanese American and white American men in the age groups

between 45 and 74) with respect to mortality from either vascular lesions affecting the central nervous system or diseases of the heart. Even if it were assumed that all deaths with cerebrovascular symptomatology in the terminal stage were classified to vascular lesions affecting the central nervous system for the Japanese, the order of magnitude suggested by the 1940 data on associated causes would account for only a small part of the reported difference between white American and Japanese mortality experience.

On the other hand, if we accept as a fact that the Japanese have higher mortality from vascular lesions of the central nervous system and lower mortality from diseases of the heart than does the white population of the United States, we are faced with a serious medical puzzle. The present consensus seems to be that atherosclerosis is an important factor in both diseases. What mechanism would diminish the effect of atherosclerosis on the coronary artery while increasing its effect on the cerebrovascular system? It might be postulated that hypertension, not atherosclerosis, is the differential factor here, on the assumption that hypertension, as such, is more likely to lead to vascular lesions affecting the central nervous system than to heart disease. (Hypertension, with or without atherosclerosis, is considered by some authorities to be the major cause of vascular lesions affecting the central nervous system, whereas the role of hypertension in heart disease is generally considered less important than the atherosclerotic process.) There is, however, nothing in the mortality data for the hypertensive diseases to support the assumption that hypertension is more common among the Japanese of the United States or Hawaii than among white Americans.

Whatever the explanation advanced, it must account for a lower mortality from heart diseases in association with a higher mortality from cerebrovascular accidents. Present research in the cardiovascular diseases, on the other hand, strongly implies that the causes raising mortality from diseases of the heart, whether atherosclerotic or hypertensive, should also raise mortality from vascular lesions affecting the central nervous system. Clearly, then,

Consultative Visits

Consultative visits pursue the following course: Observations are made of physical quarters and working conditions; equipment and glassware; handling of specimens, reports, and records in relation to the test load and the routine sequence of testing; cleaning of glassware; methods of controlling antigens and test reagents; test performance of each procedure for the examination of blood and spinal fluid; established test controls; and the standardization or control program—training, laboratory inspection, interlaboratory evaluation studies, and so on—extended to other laboratories in the State.

The practical aspects of each situation form the bases for suggestions for change or improvement. If test results are not predictably reliable because of some condition or practice in the laboratory, this is pointed out by the consultant. For example, certain serologic tests for syphilis must be performed at room temperatures between 73° and 85° F. in order to obtain valid results. If the temperature in the laboratory is higher or lower than this during certain seasons of the year, the consultant may recommend that air-conditioning or an adequate heating system be installed.

If incorrect test results are being reported because bacterially contaminated spinal fluids are being tested, the consultant suggests that grossly contaminated spinal fluids not be tested but that they be reported as "unsatisfactory for testing." He also explains the preparation and use of tubes containing merthiolate to prevent bacterial contamination of spinal fluid.

Results of tests performed by the visited laboratory on VDRL dehydrated control serums, which have an established reactivity pattern, offer the consultant an immediate check on reactivity levels. Significant differences between the laboratory's test results and the established pattern of the control serums can usually be resolved on the basis of test mechanics, antigens, reading levels, or glassware by actual comparative testing during inspection. Discrepancies in test results are sometimes due to outdated techniques or to the use of an antigen prepared by an old technique or formula.

Practical on-the-job training of laboratory

personnel is undertaken when the laboratory director so desires and when time is available. The purpose of this training may be improvement of the technical performance of tests in current use or the demonstration of new techniques and methods, or both. Sometimes changing to a different method of testing offers advantages under the particular circumstances in a laboratory. For example, if the laboratory performs a large number of quantitative tests daily, the consultant may recommend changing from a tube testing procedure to one of the slide quantitative procedures that will result in a lighter workload without sacrificing accuracy of results.

All on-the-job training and recommendations pertaining to testing procedures adhere strictly to the directions given in the 1955 *Manual of Serologic Tests for Syphilis (1)*. This manual contains general information on testing procedures and specific techniques for each of the serologic tests for syphilis most widely used in America. The manual was compiled by the Venereal Disease Research Laboratory in cooperation with the author-serologists and is available to all laboratories in the country.

Venereal Disease Research Laboratory consultants frequently suggest that one or more of the serologists from a State health department laboratory attend a refresher training course in syphilis serology at the Venereal Disease Research Laboratory. This does not necessarily mean that the State laboratory's current test performance is poor. More often it indicates that a serologist shows promise and that the laboratory would benefit by the additional training he would receive. For example, the serologist may perform the tests in current use in the State laboratory satisfactorily but may not have had experience with any other test procedure. By attending a refresher course, he may gain a working knowledge of other tests that he can use in local laboratories in his State and in providing training in these techniques and in evaluating the performance of these tests when visiting laboratories. Or the consultant may feel that the statewide standardization program could be improved by the use of a better designed evaluation study. If so, he recommends that the State serologists attend a course in management and control of

Venereal Disease Research Laboratory

Field Consultation Services

GENEVIEVE W. STOUT, M.A., AD HARRIS, and ALWILDA L. WALLACE, M.S.

ONE of the objectives of the program of the Venereal Disease Research Laboratory of the Public Health Service for the improvement of syphilis serology in the United States has been to enable State health department laboratories to guide and assist local laboratories. The State laboratory can serve effectively as a reference laboratory and training center only if the quality of its serologic testing is excellent. Periodic technical reviews are valuable aids in helping the State laboratory establish and maintain a satisfactory testing service and standardization program.

In 1951, the Venereal Disease Research Laboratory expanded its field consultation services. During fiscal years 1952-56, activities included consultative visits to State health department laboratories for the purpose of reviewing their serology activities and control programs, furnishing assistance to these laboratories for field refresher training courses or workshops in syphilis serology, and inspection of the serologic testing activities of Public Health Service hospital and clinic facilities.

During fiscal years 1952 and 1953, consultative, or laboratory inspection, visits were part of a program review monitored by the Communicable Disease Center of the Public Health Service, wherein selected areas of laboratory

activity were reviewed cooperatively by the Venereal Disease Research Laboratory and the Communicable Disease Center.

In fiscal years 1954-56, laboratory inspection visits were made only at the request and invitation of the State health officer or State laboratory director. Within a short time after each visit, the consultant sent a written report of observations, commendations, and recommendations for change, if any, to the State laboratory director, the State health officer, and the Public Health Service regional medical director.

During 1952-56, the period covered by this report, inspection reviews of central health department laboratories were made in 46 States, the District of Columbia, Alaska, Puerto Rico, and the Virgin Islands. Twelve laboratories were reviewed once; 23, twice; and 15, three times. Since December 1954 visits have been made to the laboratories of 24 Public Health Service hospitals and clinics which perform serologic tests for syphilis.

During the period 1952-56, assistance was given to 27 State health departments in conducting 61 field refresher training courses. Twenty States or Territories were visited once; 5, twice; and 2, three times. Approximately 2,000 technical workers, representing 1,000 laboratories, attended these refresher training courses. For practical reasons, technical reviews and field refresher training courses in the same State are frequently combined, and visits are made to the Public Health Service activities in the same area.

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later conducted a series of workshops at other places within the State.

There has been no single pattern for the field refresher training courses in serology since it has been necessary to design courses to meet the particular needs of each State. The consultant from the Venereal Disease Research Laboratory and the State laboratory director or senior serologists, or both, formulate a plan for these courses by means of a conference or, more frequently, by correspondence. Final organization, promotion, and publicity are the responsibility of the State laboratory.

The State health department laboratory sponsors the field refresher training course but may ask other groups, such as clinical pathologist and technologist organizations or a university, to act as co-sponsors. By discussing plans with these groups and securing their cooperation, valuable assistance is frequently obtained in the promotion of the training courses within these organizations and in encouraging technologists under their direction to attend. The content of a training course is usually determined by the tests in local use and those that the State health department wishes to advance.

Program plans differ according to the number and kinds of tests to be demonstrated and the manner of their presentation. Training courses have varied in length from 1 to 5 days. In some States, a single course has been given in the city where the State public health laboratory is located. In other States, courses have been held at several different places in order that technologists from more laboratories might attend. As many as eight courses have been conducted in a State during the visit of a consultant. Courses are scheduled to meet the convenience of the local laboratories and are frequently held in the evening or on weekends. This practice has more than doubled attendance in some instances.

In one State, a series of courses has been held in different areas at yearly intervals. In another State, courses were held in 3 successive years. The first year, formal refresher courses were held in the two largest cities in the State. The second year, a series of 4 practical "bench-work" courses were held on 4 successive Saturdays in the State health department laboratory. The third year, a serology conference

was held to discuss changes in the new Manual of Serologic Tests for Syphilis (1), the development of tests using treponemal antigens, and a problem clinic. In this way, training courses in syphilis serology were integrated into a continuous, progressive, training program.

The need for repetition of refresher courses in serology is determined by the new material to be presented and the turnover in personnel in local laboratories. During the past 5 years there have been many changes in the routine tests used for syphilis serology, with a shift from tests using lipoidal antigens to those using cardiolipin antigens. The turnover in personnel in local laboratories in many States is continuous and fairly rapid.

PHS Laboratories

Since December 1954, the program for standardization of serologic tests for syphilis in the laboratories of Public Health Service hospitals and clinics has included consultative visits by Venereal Disease Research Laboratory representatives to the 24 facilities in which these tests were being performed. In most of these laboratories, on-the-job training, in addition to a technical review of test performance, was accomplished during the visit. On-the-job training was especially indicated on the first visits because of changes in the official serologic testing methods. Many of the laboratories needed assistance in preparing orders for equipment and in training technicians in the newly prescribed test techniques.

Because laboratories in Public Health Service hospitals and clinics receive antigens and other serologic reagents from the Venereal Disease Research Laboratory, and because an evaluation study has been established to determine the proficiency with which the serologic tests for syphilis are being performed at these laboratories, future inspection visits and on-the-job training will be facilitated and expedited.

Discussion

In general, the objectives of technical and program reviews of State health department

syphilis given by the regional laboratory at the Venereal Disease Research Laboratory.

During consultative visits, the program of the State laboratory for the improvement and standardization of syphilis serology within the State is critically reviewed. Ideally, these State programs include an intrastate serology evaluation study, consultative visits to participating laboratories, and provision for training in syphilis serology. Some States offer additional services such as the distribution of standardized antigens, reagents, and controls. Each part of the program is reviewed in detail and its practical aspects are considered, as well as the limitations imposed by the funds and personnel available to the State laboratory for these additional services and the number and geographic distribution of laboratories within the State.

When an inspection visit is completed, the consultant reviews all recommendations with the director of the State health department laboratory and, unless the director objects, with the senior serologists. He also discusses a summary of the findings and general recommendations with the State health officer in the presence of the State laboratory director. Finally, the consultant submits to the State health officer and the regional medical director a written report of his observations, listing the commendable features of the existing program of the laboratory and suggesting ways of improving the weak features.

Field Refresher Courses

During the past 5 years, representatives from the Venereal Disease Research Laboratory have conducted or assisted with 61 field refresher courses in 27 States. These courses are presented as a function of the State health department laboratory program, and the position of the Venereal Disease Research Laboratory representative is clearly defined to the participants as that of a consultant to or member of the State laboratory team. The director of the State laboratory and key personnel from the serology section take an active part in the courses. Serologists from the State laboratory usually take part in the test presentations and perform the demonstrations.

One objective of the Public Health Service consultant is to assist in defining the position of the State laboratory as a reference and training center for other laboratories in the State. He draws attention to the laboratory practices of the State laboratory and refers to services that are available to local laboratories. If the State has a laboratory-approval program, time is usually allowed in the schedule for describing this program and for questions and discussion. The protocol for the State evaluation survey in syphilis serology and the method used for analyzing results are usually discussed, since they are of general interest.

Field refresher courses in syphilis serology are in two general categories: (a) a lecture demonstration, in which each test is discussed, the technique demonstrated, and the technologists given an opportunity to observe completed tests and make comparative readings; and (b) a participation-type workshop with the same presentation method, followed by actual test performance by the registrants under supervision.

In States which have a well-established standardization program in syphilis serology, the lecture-demonstration type of course is used to illustrate the correct method of performing tests in current use, to stimulate interest in new test procedures, to emphasize the precautions and controls that are essential for obtaining reliable test results, and to suggest further practical training and experience that may be obtained in the State laboratory. The participation-type course, using the "workshop" approach, has been preferable when the State does not have a standardization program or is in the process of initiating one.

When further basic instruction of local laboratory workers is needed, the State laboratory personnel can be indoctrinated into the techniques of practical training and supervision by assisting with preparations, demonstrations, and instruction. In several instances the lecture-demonstration part of the course has been followed by a half-day period during which the participants actually performed the tests of their choice under supervision of the State and consultant serologists. In one instance, this workshop type of refresher course served as orientation for State laboratory personnel who

STATEMENT

by the U. S. National Committee
on Vital Health and Statistics

National Vital Statistics Needs

THE U. S. National Committee on Vital and Health Statistics was requested by the Public Health Service to make a comprehensive study of the objectives and the program of national vital statistics, to report its findings, and to make recommendations with regard to the future development of the program. It was asked, also, to undertake a special study of the needs for marriage statistics and the extent to which existing data satisfy them.

The committee's findings and recommendations are based on:

1. An extensive questionnaire survey of the principal users of the various kinds of vital statistics and a special questionnaire survey of the major users of marriage statistics.

2. Participation in a panel discussion at a

This report was prepared by the Subcommittee on National Vital Statistics Needs: chairman, William G. Cochran, Johns Hopkins University; Harold F. Dorn, Public Health Service; Forrest E. Linder, United Nations; O. K. Sagen, Illinois State Department of Public Health; Mortimer Spiegelman, Metropolitan Life Insurance Co.; P. K. Whelpton, Scripps Foundation for Research in Population Problems, Miami University; Robert F. Lenhart, Committee for Economic Development, Washington, D. C.

A special study of national marriage statistics, the results of which are incorporated in this report, was conducted by the Subcommittee on Utilization of Marriage Statistics: chairman, Conrad Taeuber, Bureau of the Census; Myron S. Silbert, Federated Department Stores, Inc.; Clifford Kirkpatrick, University of Indiana; Ann Dillon, Tennessee State Department of Public Health; Louis Weiner, Board of Governors of Federal Reserve System; Charles B. Reeder, E. I. Dupont De Nemours and Co.

meeting of the American Association of Registration Executives on the subject "A National System of Vital Statistics."

3. Intensive studies of particular phases of the problem.

4. Frequent, long discussion meetings of the subcommittees.

In the detailed report (1), the committee has examined the major areas of responsibility of NOVS and has outlined the goals to be achieved in each area. This is followed by a statement of the principal deficiencies in the present system with respect to these goals and finally by the recommendations.

The Role of NOVS

In this country, the registration of vital events is the responsibility of the States. Each State also has the responsibility for tabulating and publishing its own data so as to meet its special needs. The tabulation and publication of national data on births, deaths, notifiable diseases, marriages, divorces, and annulments are the functions of the National Office of Vital Statistics, a branch of the Division of General Health Services, Bureau of State Services, Public Health Service.

The functions of NOVS should not be regarded as confined to the routine processing and publication of historic series of data. The justification for publishing data is that they serve some useful purpose. Vital statistics are essential for administrative purposes in both business and government and for research. Used in conjunction with population data, they provide a background (a) for public health programs and medical research, (b) for making projections of the size and composition of the

laboratories by consultants from the Venereal Disease Research Laboratory have been to commend the outstanding good features of the activities and program in syphilis serology and to offer constructive suggestions for improving weak features. Particular attention has been paid to intrastate programs for standardization of test performance since the development of these programs is an essential part of the national program. Any comprehensive plan for improvement in syphilis serology must include consideration of test performance in the local laboratory since the State laboratory usually performs only a fraction of the total tests for syphilis performed in a State.

Because the problems encountered by State health department laboratories may arise from differences in geographic locations, working conditions, and budgetary limitations, recommendations for change must be tailor-made for each laboratory. Some laboratory directors have used the recommendations of consultants regarding adequacy of laboratory facilities, equipment, glassware, air-conditioning, and personnel in preparing budget requests. For the most part, consultants' suggestions have been well received by the laboratories. Most of the recommendations made during these visits are accepted and further suggestions are usually welcomed.

In the past 5 years, with the adoption of newer and simpler testing techniques in syphilis serology, there has been a marked change in routine testing operations. The training of serologists accomplished during visits of Venereal Disease Research Laboratory consultants to their laboratories has been valuable in this transition period.

Field refresher training courses in syphilis serology have enabled State health department laboratories to increase their accomplishments in this essential phase of State standardization programs in syphilis serology. As a part of the State programs, these refresher courses or workshops have had the following results:

1. Performance of serologic tests for syphilis has improved.
2. Modern testing methods with cardiolipin antigens have been generally adopted.
3. The position of the State health department laboratory as a reference laboratory and

training center has been emphasized and a closer working relationship with local laboratories has developed.

Indirectly, the field refresher training courses have also been utilized in training medical technologists and public health laboratory workers in universities, colleges, and hospitals. Instructors from teaching institutions frequently attend these field courses. In several instances, they have requested and received additional training in courses at the Venereal Disease Research Laboratory. In one State, a workshop in syphilis serology was recently conducted for college and university instructors in clinical laboratory technology and public health bacteriology.

Consultative visits to State public health laboratories integrate the activities of the Public Health Service Venereal Disease Research Laboratory with these State laboratories. The program of the Venereal Disease Research Laboratory for the improvement and standardization of syphilis serology has been applied by many State laboratories. The State and Territorial health department laboratories are continually improving and modernizing their own testing operations and, by working with local laboratories, have helped the local laboratories to attain dependable performance of serologic tests for syphilis.

Summary

The field consultation services of the Venereal Disease Research Laboratory of the Public Health Service during a 5-year period which includes the fiscal year 1956 have included reviewing the syphilis serology activities and programs of the State health department laboratories, assisting States in field refresher training courses or workshops in syphilis serology, and inspecting serologic testing in Public Health Service hospital and clinic facilities. Utilizing such services has aided State health department laboratories to develop statewide programs for the standardization and control of syphilis serology.

REFERENCE

- (1) Public Health Service: Serologic tests for syphilis. 1955 manual. PHS Pub. No. 411. Washington, D. C., U. S. Government Printing Office, 1955.

collection of mortality statistics and, if the use of this method to collect birth statistics is continued at all, should limit it to the few States where it can be shown to be mutually advantageous and where it will not adversely affect the scope, quality, continuity, and usefulness of national vital statistics.

5. NOVS should continue to cooperate with the States in studies of ways to improve the division of labor in the national vital statistics system. Changes in the system should be made only after full consideration of: (a) the basic requirements for national vital statistics; (b) safeguards for the continuity of operation; (c) opportunities to improve the final product and to render maximum services.

The committee also notes that marriage and divorce (including annulment) statistics are in a highly unsatisfactory state as regards geographic coverage, uniformity of reporting, accuracy, and amount of detail. A program for the improvement of these data should be consistent with the above recommendations and receive the same level of priority, but it is recognized that it is not possible to carry out such a program under the present budgetary position. The committee recommends that:

1. NOVS work actively to establish a marriage registration area through implementation of the four criteria established for admission to the area, and to extend it until every State is included. These criteria are: (a) central record files for marriages in the State office containing items on standard record of marriage form; (b) adoption of report form of marriage containing the items on the standard record of marriage form; (c) reporting by all local areas regularly to the State office; (d) agreement between State office and National Office of Vital Statistics on joint testing of reporting for completeness and accuracy.

2. Methods of collecting marriage statistics be explored with a view to assuring (a) complete coverage of the United States, (b) uniform data both between and within States, (c) comparability of time series, and (d) accuracy of information.

3. NOVS obtain copies of marriage records from the States and local areas to be processed

statistics on divorce and annulment. If specific recommendations are deferred thorough study of this problem can be

Other Recommendations

Completeness of data: NOVS should late and assist in special studies of birth registration completeness in areas where completeness of registration is still a problem.

NOVS should endeavor to develop for measuring incompleteness of death fetal death registration adaptable to the where this problem is important. If techniques can be found, they should be to obtain more information on the extent of completeness and on means for attaining complete reporting.

Efforts toward improvement of notification of disease reporting should be concentrated on those diseases that are major health problems and are amenable to control procedures.

NOVS should cooperate with the States in the development and application of tests for completeness of the reporting of marriages, divorces, and annulments to the central office and on the accuracy of the information in report forms.

Uniformity of data: NOVS and the State vital statistics offices should continue efforts to obtain complete coverage of all marriages on the standard certificates.

Scope and detail: NOVS should have a closer touch with the users of its data in planning the scope and detail of its tables and publications and when making decisions on fundamental issues.

Explanatory and interpretive text: The analytical functions of NOVS should be strengthened to make available more explanatory and interpretive material useful to consumers.

Cyclical schedule of tabulations: The concept of cyclical collection and tabulation of data should be firmly established as a part of the regular program of NOVS with appropriate safeguards in regard to the continuity of various tabulation cycles.

Use of Vital Statistics

population, and (c) for the study of trends regarding family formation, composition and dissolution, and other aspects of our society. NOVS has major responsibilities both for making available the kind of data that will be most useful in these areas and for stimulating widespread and fruitful application of these data. These responsibilities call for foresight and flexibility to meet changing needs. Further, although many of the uses of vital statistics lie in the field of public health, the data also have important applications to demography.

The fact that NOVS is a part of the Public Health Service insures full recognition of the health interests in vital statistics. This implies an obligation and responsibility to maintain a national vital statistics program that is not overshadowed by health interests but also meets the justifiable needs in the demographic and other areas of interest.

Major Recommendations and Observations

The committee wishes to draw particular attention to the following recommendations which appear to deserve the highest priority:

Immediate priority should be given to the processing and procurement of data so as to achieve a schedule of processing which permits the release for printing of final data within 15 months after the close of the data year, and this schedule should be maintained or improved upon in the future.

Statistical studies that contribute to knowledge in public health, fertility, marriage, divorce, and mortality should be developed as part of the regular program of NOVS. In particular, attention should be given to the influence of population characteristics, such as sex, age, marital status, and occupation. The program should include collection of new data and development of new methods of analysis that are needed for program planning, administration, and research.

NOVS should be given sufficient fiscal resources to provide more adequate technical services to the States in the following areas: professional advisory and consultant service on technical and management problems; expanded information and clearinghouse services on technical subjects and methodology; educational

programs directed toward improvement of source data; national program for recruiting and training professional vital statistics personnel; and work with State health department program divisions in promoting effective utilization of vital statistics data.

The committee has also examined two alternative methods of producing national vital statistics, in particular the use of data pretabulated by the States and of punchcards supplied by the States. Recommendations with regard to these alternatives are as follows:

1. NOVS should reject any data procurement method that limits or restricts the use of vital statistics records for research or that prevents it from controlling the quality of national vital statistics tabulations. Specifically, NOVS should procure transcripts of the individual vital records for processing.

2. NOVS should reject the proposal to produce national vital statistics from data pretabulated by the States because: (a) the available national data would shrink to those obtainable from a minimum rigid list of tabulations; (b) it would become very difficult to make national studies based upon information obtainable only from transcripts of the individual records or from individual punchcards; (c) it would add to the cost of State operations without a compensatory decrease in the cost to NOVS.

3. NOVS should reject the punchcard method of collecting vital statistics data as a general method applicable to all States because: (a) it restricts the freedom of action both of the State offices of vital statistics and of NOVS, thus making vital statistics less useful rather than more useful; (b) effective leadership in national and international vital statistics will be sacrificed because of the loss of technical skills and knowledge in NOVS; (c) the scope and detail of national vital statistics cannot be greater than those of the participating State ranking lowest in these respects; (d) the possible savings in cost are outweighed by the disadvantages of the method; (e) the overlapping of State and Federal vital statistics procedures, tabulations, and needs is not great enough to make this method possible without serious disadvantages to both parties.

4. NOVS should abandon any further experimentation with the punchcard method in the

in colleges and universities, in government, and in private research.

2. The returns indicate use by individuals in business organizations for estimating household formation and for predicting demand for consumer goods. Persons in research and academic fields expressed a preference for data useful in sociological and demographic research.

3. With respect to the time-space aspect of statistical reporting, the broader categories were favored. Although there was strong support for monthly totals and for annual national and State reporting of more detailed figures, there seemed to be a relatively limited demand

for reporting of the monthly figures in advance of present publications.

4. Strong support was expressed for complete national and State coverage on an annual basis and for more specific data, with cross-tabulations for bride and groom, and information on items not available from registration records.

REFERENCE

- (1) U. S. National Committee on Vital and Health Statistics, Subcommittee on National Vital Statistics: National vital statistics needs. Vital Statistics—Special Reports, vol. 45, No. 11. U. S. Government Printing Office, 1957.

CDC Laboratory Refresher Training Courses

Laboratory refresher training courses at the Communicable Disease Center, Chamblee, Ga., will be offered during the period September 1957 through March 1958 according to the following schedule:

Laboratory methods in the diagnosis of parasitic diseases:

Part 1. Intestinal parasites. September 9–October 4.

Part 2. Blood parasites. October 7–25.

Laboratory methods in the diagnosis of viral and and rickettsial diseases. October 14–25, March 10–21.

Laboratory methods in the diagnosis of rabies. October 28–November 1, March 24–28.

Laboratory methods in medical mycology—cutaneous, subcutaneous, and systemic fungi. January 6–24.

Laboratory methods in the diagnosis of tuberculosis. January 20–31.

Laboratory methods in the study of pulmonary mycoses. February 3–14.

Laboratory methods in the diagnosis of bacterial diseases:

Part 1. General bacteriology. February 10–21.

Part 2. General bacteriology. February 24–March 7.

Laboratory diagnostic methods in veterinary mycology. February 24–28.

Laboratory methods in the diagnosis of bacterial diseases—enteric bacteriology. March 10–21.

Serologic methods in the diagnosis of parasitic and mycotic infections. March 10–21.

By special arrangement the following courses will be offered:

Laboratory methods in the diagnosis of malaria.

Special training in virus techniques.

Typing of *Corynebacterium diphtheriae*.

Special problems in enteric bacteriology.

Phage typing of *Salmonella typhosa*.

Laboratory methods in the diagnosis of leptospirosis.

Serologic differentiation of streptococci.

Bacteriophage typing of staphylococci.

Information and application forms should be requested from the Laboratory Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

aspect of vital statistics data; replies were received from 254 of them. Although the committee was aware of the limitations of a questionnaire of this type, information was sought regarding the relative frequency with which various types of vital statistics are used and the different sources from which these data are obtained; the extent to which the respondents regard available vital statistics as adequate for their uses; and, ways of reducing the quantity of material published by NOVS and still meeting the important needs of consumers. The results of the questionnaire may be summarized as follows:

Frequency of use of types of data: Mortality and natality statistics are the data issued by the National Office of Vital Statistics which are used most frequently by the persons replying. Next in order of frequency of use are the statistics on marriages and notifiable diseases. The consumers surveyed showed the least interest in fetal death statistics and divorce statistics. This generally corresponds to the requests for data received by NOVS.

Geographic categories used: An overwhelming majority of the consumers surveyed indicated use of statistics for the country as a whole and for States. Also, the majority of respondents appear to have need for data on all of the other geographic areas listed.

Use of State and local publications: Excluding State registrars of vital statistics, relatively little reference appears to be made to State and local publications. However, this may be due, in part, to the composition of the list of persons and agencies surveyed.

Secondary references: Of the secondary references, the Statistical Abstract of the Bureau of the Census is most frequently used, followed by the United Nations Demographic Yearbook and by the World Almanac.

Unpublished data: About one-half of the respondents stated that they have requested unpublished data from NOVS.

Timeliness: The dissatisfaction expressed most frequently and most strongly concerning NOVS publications related to the lack of timeliness of their issuance. The release of unpublished data to those requesting them appears to have softened the reactions of some of the re-

spondents. Considerable understanding and appreciation of the problems faced by NOVS in the early publication of data were evident, but the general opinion was that the data would be much more useful if they could be issued on a more timely schedule.

Accuracy: Most of the respondents did not express any opinion concerning accuracy, except to indicate general satisfaction with the quality of data. Most of the defects mentioned were those that have been already recognized by NOVS, namely, errors in residence allocation of births and deaths, and incompleteness of notifiable disease statistics.

Scope and detail: A large proportion of respondents indicated satisfaction with the existing scope and detail of the published data. There were relatively few suggestions for reducing the quantity of data published.

Use of Marriage Statistics

A second questionnaire devoted exclusively to marriage statistics was sent to 539 persons or agencies to obtain information concerning uses and needs indicated by consumers of marriage statistics. Replies were received from 262, or 49 percent. While one question dealt with potential uses if statistics were available, it is doubtful that the full effect of supply on demand is revealed. Perhaps improved statistics must actually be available in order to call out full expression of demand from consumers.

Since users of marriage statistics were selected as respondents it is to be expected that use would be reported in ways proportionate to the kind of persons included in the mailing list; namely, businessmen, university people, private researchers, and government officials. In the judgment of the committee the mailing list of business users stressed national organizations, and the survey may have failed to reach local users in business fields. Probably, the questionnaire survey was most effective in revealing the varied uses of marriage statistics, in indicating the scope of the desired data, and in eliciting new suggestions.

The four general findings of the survey:

1. There is evidence of extensive use of marriage statistics in large business organizations,



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frontispiece

Mental health papers and conference reports on pages 571-650.

Film Reference Guide for Medicine and Allied Sciences

PHS Publication No. 487. June 1956. 51 pages. 45 cents.

This guide is designed to provide members of the Interdepartmental Committee on Medical Training Aids, as well as film users outside ICMTA member agencies, with a ready reference to selected medical films and to where they may be obtained.

Publication numbers for other ICMTA members are: Air Force, AFP 160-15-1; Army, DA Pamphlet 108-2; Navy, NAV MED P 5042; Veterans Administration, Catalog 7. Copies can be obtained from the Card Division, Library of Congress, Washington 25, D. C.

Communicable Disease Center

Report of activities, 1954-55

PHS Publication No. 521. 1957. 63 pages; illustrated.

This report on the major activities of the Communicable Disease Center, Bureau of State Services, Public Health Service, summarizes the accomplishments of CDC's several organizational components during the fiscal year 1955. It is also intended to aid State, local, and other health agencies in planning their programs.

The work reported has been divided into broad categories corresponding to the Center's pattern of operation and reveals the scope, nature, and interrelationships of activities carried on by the combined staff. It covers such areas as epidemic and disaster aid, epidemiological surveillance, field and laboratory investigations of specific diseases and disease vectors, and development of diagnostic procedures.

It describes special operational services given the States in the form of consultations, demonstrations, program reviews and laboratory diagnostic and reference services, as well as training programs for laboratory and field work and the production of audiovisual and other aids.

A bibliography of articles published by CDC staff members and their collaborators during late 1954 and 1955 is appended. Titles are arranged according to subject matter so that readers can select articles dealing with their special fields of interest.

Sanitary Engineering Aspects of the Atomic Energy Industry

U. S. Atomic Energy Commission Publication No. TID-7517, parts Ia and Ib, October 1956. 957 pages. \$3.10.

This publication, in two parts, contains reports presented at a seminar sponsored by the Atomic Energy Commission and the Public Health Service, held at the Robert A. Taft Engineering Center, Cincinnati, Ohio, December 6-9, 1955.

Part Ia presents technical data from unclassified AEC papers concerned with radioactive waste disposal problems of interest to public health agencies and to sanitary engineers.

Part Ib includes technical data contributed by Public Health Service participants. Public Health Service interests, contributions, activities, and technical and administrative aspects of environmental health problems of the atomic energy industry are considered.

As a whole, the publication presents the advantages, limitations, comparative hazard, and the present most promising approaches to radioactive waste disposal problems attendant on broadening the atomic

energy industry into peaceful uses by testing ideas and proposals presented in terms of possible public attitudes. Also discussed is the responsibility of public officials for regulating the industry so that the hazard to the public may remain within acceptable limits, without impeding practical applications of nuclear energy.

Copies are available from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Workshops for the Disabled

A vocational rehabilitation resource

Office of Vocational Rehabilitation Publication. Rehabilitation Service Series No. 371. 1956. 167 pages. 60 cents.

Prepared by leading rehabilitation and workshop authorities, this publication is designed to familiarize the reader with the origin and nature of the services afforded by various types of workshops and some of the problems they face.

The bulletin traces some of the developments of different kinds of shops under diverse auspices. It attempts to show how such shops can be resources for many of the services necessary for the vocational rehabilitation of persons having substantial employment handicaps.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Health Services for American Indians

GEORGE ST.J. PERROTT and MARGARET D. WEST

INDIANS in the United States present certain unique problems in the field of public health. Indians are not the only group in this country with excessive rates of death and disease, nor are they the only group in which cultural differences complicate the application of accepted methods of preventing and treating disease. Indians, however, traditionally have received health and medical services through the Federal Government. The Indian health program, formerly administered by the Bureau of Indian Affairs of the Department of the Interior, was transferred to the Public Health Service on July 1, 1955, so that the full technical resources of an agency devoted to improving health might be focused on Indian health problems.

What are the most urgent health needs of Indians? What special problems arise in attempts to meet those needs? The Public Health Service has just published the results of a 16-month survey dealing with these and related questions. The survey was limited to the health problems of Indians in the continental United States, although the Public Health Service has responsibility also for health services to Alaska natives. Two years ago a study of health problems among Alaska natives was made for the Department of the Interior by the University of Pittsburgh.

Federal health services for Indians began more than 150 years ago in attempts by the

War Department to control smallpox among tribes in the vicinity of military forts. Following the transfer of the Bureau of Indian Affairs to the Interior Department in 1849, services gradually were extended and improved. As early as 1926 the Public Health Service detailed physicians from its commissioned corps to help the Bureau of Indian Affairs in administering health aspects of the Indian program.

By the 1950's such diseases as smallpox and trachoma had been largely eliminated on most of the approximately 250 reservations under Federal jurisdiction. Less progress had been made in controlling tuberculosis, diseases of early infancy, gastroenteric diseases, and certain other communicable diseases, while accidents were increasing at an alarming rate. The Government had succeeded only partially in implementing its policy of having Indians wherever possible receive care through agencies and authorities serving the general population.

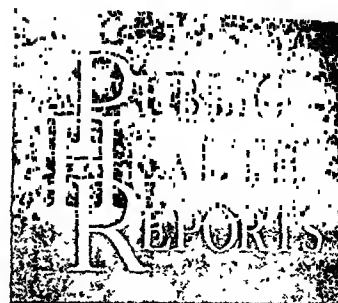
What accounted for the continuing lag in Indian health? Lack of adequate health services appeared to share at least part of the blame. Under the Bureau of Indian Affairs, the Indian health program had never had enough qualified staff, well-equipped facilities, or funds to extend services to all Indians needing them. This applied particularly to preventive services.

A basic problem facing the Public Health Service when it took over the health program 2 years ago was lack of accurate and up-to-date information on Indian health needs and services available to meet those needs. In making its first appropriation to the Public Health Service for Indian health purposes, the House Committee on Appropriations provided an ad-

Mr. Perrott is chief of the Division of Public Health Methods, Public Health Service, and Mrs. West is head of the Health Services Requirements Branch of that division. They were the director and associate director, respectively, of the survey of Indian health problems described in this article.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSON, *Secretary*

PUBLIC HEALTH SERVICE

LEROY F. BURNET, *Surgeon General*

Indian Health Survey

At the request of the House Committee on Appropriations, the Public Health Service has made a comprehensive study of the health problems of the American Indian. This 16-month study was made by the Division of Public Health Methods, with the assistance and cooperation of the Division of Indian Health of the Bureau of Medical Services and a number of other offices of the Public Health Service. The Bureau of Indian Affairs also participated.

The report of the survey, *Health Services for American Indians*, is available from the Superintendent of Documents as Public Health Service Publication No. 531, 1957, 344 pp., \$1.75.

the Indians in 1950 were under 20 years of age, compared with one-third for the general population, while the proportion in older age groups was considerably smaller than the United States average. The estimated Indian population has increased steadily since the late 19th century, its high death rates offset by still higher birth rates. Culturally, Indians range from isolated groups speaking their own languages and retaining many aboriginal customs, such as the Navajo, to groups scarcely distinguishable from their non-Indian neighbors, such as certain groups in Oklahoma.

Most Urgent Health Problems

Indians today have health problems resembling in many respects those of the general population of the Nation a generation ago. Although conditions vary widely among reservations in different parts of the country, the most urgent problems appear to be tuberculosis, certain other communicable diseases for which control measures are fairly well established, and accidents, which are recognized increasingly as a public health problem (see figure). These causes account for most of the excess deaths among Indians, that is, the excess of actual deaths over the deaths that would have occurred had each age group among the Indians had the average death rates for that age group in the United States. Together with obstetrical cases, the same causes also account for most of the patient-days in Indian hospitals.

Most of the health problems are especially acute among infants and children. In 1953, Indian children under 5 had a death rate more than double the national average. Their mortality rates for such diseases as tuberculosis, pneumonia and influenza, and gastroenteritis were proportionately much higher. Children under 15 in 1955 accounted for almost 40 percent of the patient-days in Indian hospitals; this contrasts with 12 percent for the same age group in all general and allied special hospitals in the United States.

The clinical examinations of this survey found a high prevalence of visual defects, ear diseases, and dental caries, as well as many cases of diarrheal disease, tuberculosis, and acute respiratory disease. Prevalence of visual defects was particularly striking. About three-quarters of those examined had defective vision, the proportion blind was very high, and there was ample evidence not only of old trachoma but also, on one reservation, of current, active trachoma.

Hazards of Reservation Environment

There can be no doubt that environmental conditions on Indian reservations tend to promote disease among Indians. Although conditions vary among reservations and within any single reservation, the typical Indian family lives in substandard and overcrowded housing. The number of families without a safe water supply or adequate means of waste disposal is very large. In many areas flies, rodents, and other vectors of disease are a serious public health problem.

Insanitary living conditions are not the only hazard of reservation environment. Geographic isolation hampers efforts to extend health and medical services to sparsely settled areas that lack adequate roads or are located many miles from centers of population. In few areas has the Indian health program been able to provide adequate field health services for families living far from existing health facilities.

The Indian health program for many years has sought to improve sanitary conditions in Indian communities and to establish additional clinics or field stations in outlying districts of reservations. Recently developed use of Indian

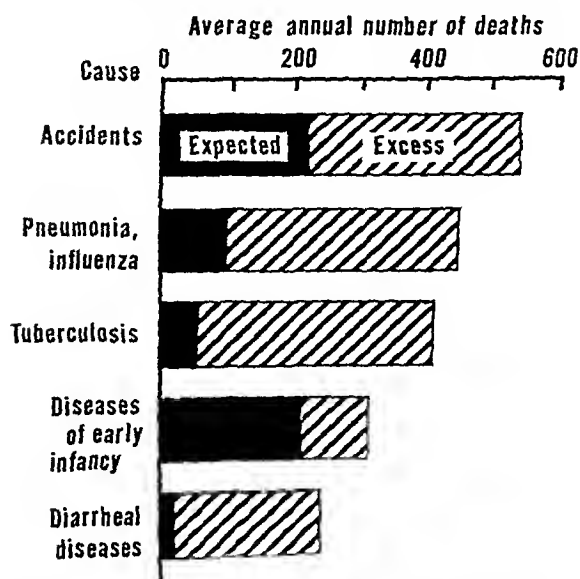
ditional \$250,000 for "a careful comprehensive evaluation of the Indian health problem."

Method of Survey

The Division of Public Health Methods of the Office of the Surgeon General bore primary responsibility for organizing and carrying out the recent survey, with other units of the Public Health Service contributing staff and services. The study of economic and social resources was carried on under the general direction of a staff member of the Bureau of Indian Affairs detailed to the Public Health Service for this purpose.

Perhaps the most noteworthy means used for filling gaps in available information was the sample study of the populations of selected Indian reservations. On 9 reservations, chosen from 9 different States having substantial Indian populations, local Indian interviewers obtained information from each household on the reservation on extent of illness and receipt of medical care during the preceding year. On 5 of the 9 reservations, the interviews were followed by an intensive medical examination of a sample of the surveyed population. Indian

Indian deaths from selected causes, expected and actual: annual average 1949-53.



SOURCE: Data in support of this chart appear in the report, *Health Services for American Indians*, PHS Publication No. 531, 1957.

participation in both interview and clinical surveys was good, particularly in view of language difficulties, the geographically scattered nature of many Indian communities, and the Indians' general lack of familiarity with the types of questions and procedures in the survey.

Hospital and medical care services available through Public Health Service and contract facilities were studied both in the field and by means of questionnaires. Four special disease problems—tuberculosis, maternal and child health, mental health, and dental health—were singled out for special review by Public Health Service specialists and university consultants. Five universities or research institutions conducted field studies of social and economic resources available for Indian health purposes. Altogether 39 reservations in 16 States were visited in connection with one or more phases of the survey, while a statewide socioeconomic study was conducted in Oklahoma.

The Indian Population

According to estimates of the Bureau of Indian Affairs, Indians in the continental United States in 1955 numbered about 472,000. Of these about 280,000 lived on Federal Indian reservations. Although the total Indian population is not large relative to the total United States population, it is concentrated in certain States. Arizona's 66,800 Indians in 1950 constituted 9 percent of that State's inhabitants. Other States having a sizable proportion of Indians are New Mexico, South Dakota, Nevada, Montana, Oklahoma, North Dakota, and Wyoming.

Not all Indians in the United States live in areas served by the Public Health Service Indian health program. Of the total of 472,000, about 50,000 belong to tribes not under Federal jurisdiction. Another 85,000 or so live in places well removed from reservations or otherwise without ready access to Federal Indian health facilities. Public Health Service facilities actually are available to an estimated 335,000 Indians living on or near reservations.

For health and medical care purposes, the outstanding characteristics of the Indian population probably are its youth, its tendency to increase, and its cultural diversity. Half of



Laguna Pueblo nurse tests the hearing of an Acoma mother at the survey clinical examination of Acoma Pueblo Indians in New Mexico.

nities to attend meetings with professional colleagues. Another deterrent is overcrowded and ill-equipped staff housing. The Public Health Service is attempting to provide for its employees on Indian reservations houses that are adequately heated, properly equipped, and big enough to meet normal living needs.

Can Indians themselves be trained to provide health services to their own people? Establishment in 1935 of the Kiowa (Oklahoma) School of Practical Nursing marked the start of a successful and still-expanding program to train Indian girls for auxiliary nursing work. The newer training program for Indian sanitarian aides represents another attempt to give Indians an active role in the provision of health services. The Indian health survey report notes the value of these training programs and favors extending them to include courses for dental assistants and medical technologists. Training of additional Indians for such professions as medicine, dentistry, and nursing may be possible in the future as greater numbers of young Indians complete the basic high school and college education requirements for these professions.

Use of Community Resources

Over the past half century, the Federal Government increasingly has arranged for Indians to receive needed services through resources available to the general population. This shift from direct to community services came earliest in the field of public education. It has occur-

red more gradually in the health field as communities in the vicinity of Indian reservations have developed public health and medical care services.

The extent to which Indians now receive services through community resources varies from area to area. On a growing number of reservations, the Indian health program has successfully arranged for hospital care in community hospitals, medical services by community physicians, and public health services under contract with local health authorities. Other Indian groups still are too far removed from outside communities to use community resources, have access only to limited community services, are refused care by the community, or will accept only Federal services.

Perhaps the greatest obstacle to widespread Indian use of community resources has been the fact that in so many areas Indian groups still lack access to community services adequate to meet their needs. In recent years, Federal grants under the Hospital Survey and Construction Act have helped to establish several small general hospitals near Indian reservations. One of the subjects singled out in the survey report as requiring further study was the possibility of adapting or supplementing



Crow nurse measures the height of a Crow boy at the survey clinical examination on the reservation in Montana.

sanitarian aides shows promise of helping to enlist local Indian cooperation in the elimination of certain sanitary hazards.

Poverty Among Indians

Findings of the social and economic surveys confirmed that the great majority of Indians living on reservations are poor and have limited opportunities for improving their economic status. Indians with larger incomes did not necessarily have more healthful standards of living. Apparently education, experience away from the reservation, or acculturation acquired in other ways played as much of a part in de-



Crow Indian receives hot coffee while waiting for his survey clinical examination. The outside temperature was well below zero.

termining living standards as did dollar income. The clinical examinations of five selected reservations did suggest that medical need among persons in the lowest level was somewhat higher than among persons at higher economic levels.

The fact that Indians are poor means that a large proportion of them cannot pay for medical care without depriving themselves of necessities of life; that is, they are "medically indigent." Medical indigency is not confined to Indians with the lowest money incomes. Some Indians have incomes that might be considered adequate to pay certain types of medical costs but which actually have been spent for other purposes when medical needs arise. In the case of medical care costs, many Indians still regard free medical care as a service to which they are entitled by right, regardless of their economic status.

Available information suggests that economic opportunities on reservations generally are becoming worse rather than better. As one means of reducing the imbalance between resources and population on the reservations, the Bureau of Indian Affairs in recent years has promoted voluntary relocation of Indians in communities away from the reservation where job opportunities are known to exist.

Problem of Staffing

Lack of adequate staff has plagued the Indian health program to varying degrees throughout its history. Supporters of the transfer of the program to the Public Health Service argued, among other things, that the health agency would be better able than the Bureau of Indian Affairs to recruit and retain competent employees. The total number of persons employed has increased since the transfer to the Public Health Service, but recruitment continues to be a problem.

What are the chief deterrents to employment in the Indian health program? Professional and social isolation appears to discourage many from accepting or keeping jobs in the service. This emphasizes the need for planned rotation of assignments in isolated areas, fewer lone assignments, greater access to professional literature and consultation, and more opportu-

Concepts and Needs for mental health



This issue of *Public Health Reports* carries its first special section on mental health. This is not because the relative importance of the subject has changed radically in recent months. But there have been significant shifts in attitudes and concepts in recent years which have excited interest among public health workers. Fresh optimism, inspired in part by biochemical studies and in part by social and legislative gains, has been accompanied by realistic appraisals of the stony path still to be traveled. The tenor of imaginative appeals and panaceas for mental health is balanced by a baritone insistence upon disciplined observation and experiment. This baritone obbligato is pronounced in the following pages in a symposium on the epidemiology of mental disorder, in reports of committees summoned for the first conference organized by the Psychopharmacology Service Center of the Public Health Service, and in comments in the symposium on ataractics. A tone of economic and legislative realism for mental health prevails also in the paper by Spector.

The past century has witnessed the contributions of Kraepelin, the great nosologist of mental disorder; Freud, whose imaginative concepts helped psychiatrists to think in fresh categories; and Dix, who did so much to create a humane attitude toward mental patients of any category. The next century

may see celebrated the names of those who gain acceptance of criteria for public mental health, who succeed in identifying and describing molecular causes of mental illness, who develop reliable methods of diagnosis, prognosis, and therapy for the individual mental patient, and who pioneer social and environmental methods to improve the mental health of all.

For the present, it is evident in the remarks of Dr. Sanford and others at the National Health Forum that society is still struggling with the definition and concept of mental health, individual or public, structural or functional, psychic or somatic. At the same time, the disturbed, the depressed, the euphoric, and the suicidal patients are scarcely an academic matter in the hospital, clinic, office, factory, or home. They are looked upon today more with sympathy than with fear, awe, derision, or contempt. They are less subject to humiliation, restraint, assault, or neglect than in the past. They are instead the potential beneficiaries of a genuine desire by professional workers to relieve and heal mental distress. Unfortunately, the facts and facilities available are still far short of the need, as indicated in this section by Lomkau, Bloch, Windle, and others.

—ROBERT H. FELIX, M.D., director.
National Institute of Mental Health.

existing Federal construction grant and loan programs to take special account of the health needs of communities having a large ratio of Indian population. In general, the Federal Government may be able to play an increased role in helping communities in the vicinity of Indian reservations to raise the level of their health and medical services.

An important distinction exists between use by Indians of community resources with the Federal Indian health program continuing to pay all or part of the costs of care, and such use with the costs paid by the Indians themselves or by some other non-Federal resource. An Indian may be willing to go to a contract hospital rather than to an Indian hospital, so long as the Government continues to pay the costs, but may object to receiving such care at his own expense. State or local health or welfare agencies may consent to furnishing preventive health or public medical services to Indians under contract with the Federal Government, but may be reluctant to provide such services out of State or local funds.

Federal and State Responsibilities

Precise distribution of responsibility for services to Indians between Federal and State or local governments has been a recurring problem in the Indian health program. The Federal Government for many years has provided health care to Indians in certain parts of the

country. Indians as citizens of their respective jurisdictions also are entitled to receive available State and local services. The Indian health survey shows that the actual distribution of functions between the Public Health Service and State or local health and welfare authorities varies greatly from State to State.

Present Federal regulations on beneficiaries of Indian health services permit considerable local exercise of discretion in the determination of recipients of care. Such discretion is essential if the Public Health Service is to take account of variations in local circumstances such as size of local disease problem, prevalence of medical indigency, availability of alternative health services, degree of Indian acculturation, and other factors affecting the need for Federal care.

The survey identifies some of the questions that have arisen as the Public Health Service has attempted to form a workable concept of the scope of its responsibility for Indian health. Among these is that relating to the Federal responsibility for Indians who are eligible also for State and local services, particularly those financed in part by Federal grants-in-aid.

The Public Health Service in seeking to draw a clearer line between its obligations and those of the States and localities considers the policies pursued by the Bureau of Indian Affairs in the administration of other programs for Indians.

Research Training Program

Additional research training opportunity is available to outstanding students in 82 schools of medicine, dentistry, and osteopathy. The program is an extension of the research fellowship program administered by the PHS National Institutes of Health.

Established to increase the number of medical, dental, biological, and mental health researchers, the program will provide training to 140 undergraduate students during the first year. Outstanding students who have completed at least one academic year have been nominated by their deans. Each student will drop his regular courses during the research training, which starts in September 1957. Participants will receive tuition plus a stipend of not over \$3,200 per year to be set by the school and an allowance of \$350 per year for each dependent.

All the while Kraepelin recognized the limitations which clinical work will always have, and he considered clinical classifications as an intermediate aim in the search for the disease processes. But, as he observed, "until we get a better hold of the disease processes we must get along with clinical groupings which are more than the mere comprehension of symptoms into syndromes but less than the recognition of disease processes."

Evaluating Kraepelin's accomplishments, Mayer-Gross has said: "Kraepelin's approach was nosological. . . . It is on the basis of his work that we are now able to classify mental disorders into three main classes, the organic psychoses, the endogenous psychoses without known structural pathology, and the deviations of personality and reactive states. Kraepelin's ideas proved practical and fertile, although they required and received considerable subsequent modification. Kraepelin himself recognized this and was always ready to change his theoretical point of view. The nosological conception which he took from medicine has proved too valuable to be entirely discarded, even by the most fanatically 'psychodynamic' schools."

Kraepelin worked on all three categories of mental disorders. But it was in the second category, the endogenous psychoses, that he made his greatest contributions. The groups of the manic-depressive psychoses and of the endogenous dementias became and remained clinically valid. Today, 30 years after Kraepelin's death, there is no doubt regarding the clinical validity of this part of his work.

Kraepelin's choice of a career came early in his life. By the time he was 15, he had decided he would be a physician, preferably a professor of medicine. At the age of 20, after he had passed the examination in the preclinical disciplines, he came in contact with psychology through a summer course under Wilhelm Wundt. He turned his attention to this field, with a view toward teaching and investigation in psychiatry.

After receiving the degree of doctor of medicine in 1878, he served for a time as assistant to Bernhard von Gudden. In 1882 he went to the University of Leipzig to work in Wundt's laboratory, and the next year the first edition of

his textbook on psychiatry, under the title "Compendium of Psychiatry: For the Use of Students and Physicians," was published. This edition was not a classification as were later editions, but in it is evidence that the young psychiatrist was already nosologically minded. "The definition and circumscription of separate forms of disease is the next task of a special pathology of mental disorders," he says in the introduction.

His work as professor of psychiatry began in Dorpat in 1886, when he was only 30 years old. Here, he wrote the second and third editions of his famous book, which, though built essentially on symptom complexes, show some groping toward a clinical classification in the sense of a nosology. In these editions, for example, one may see nuclei of a part of the disturbances later subsumed under *dementia praecox*.

As a professor in Heidelberg from 1891 until 1906, Kraepelin spent the happiest time of his life. Despite his obligations as teacher, member of the faculty, and manager of a clinic, he had time to pursue his special interests in association with such men as Aschaffenburg, Nissl, Alzheimer, and Gaupp. When a call came from Munich to take charge of the new clinic, he accepted "with the feeling of sacrificing my own happiness to science," he said.

The year 1917 saw the establishment of the German Institute for Psychiatric Research in Munich, the fulfillment of a plan Kraepelin had conceived many years before. Speaking at the annual meeting of the German Association for Psychiatry in 1913, he described preparatory work for the foundation of such an institute. It "shall not serve clinical research, but the study of the essence and origination of the mental diseases." He planned a "clinical-experimental department with a small ward and serologic, chemical, and psychological laboratories, and an anatomic-histological department, and a demographic-statistical department for the study of degeneration." Originally housed in Kraepelin's clinic, the research staff moved to its own quarters in 1928.

Kraepelin's later years were as full as ever. He continued to teach—he did not resign his professorship until 1922, although he was absorbed in the work of his institute—to study, and to write. Many of his papers concerned



Epidemiology

of Mental Disorder

In commemoration of the centennial of the birth of Emil Kraepelin, a 2-day symposium on mental disorder was held at the 1956 meeting of the American Association for the Advancement of Science in New York City. Briefed on these pages are 11 of the papers presented at the session, which was sponsored jointly by the American Psychiatric Association and the American Public Health Association. Proceedings of the session are scheduled for publication by the American Association for the Advancement of Science.

The Life and Work Of Emil Kraepelin

brief The work of more than one generation of psychiatrists would not have been possible without the achievements of Emil Kraepelin. In the words of Professor Yushi Uchimura, "Kraepelin was eminent in introducing many-sided scientific methods of investigation and of founding exact ways of observing psychic anomaly. Most important, he was the teacher of prominent researchers."

Based on the Emil Kraepelin Memorial Lecture delivered by Eugen Kahn, M.D., professor of psychiatry, Baylor University College of Medicine, Houston, Tex., and a pupil of Kraepelin's.

Kraepelin, born in 1856 in Neustrelitz, Germany, was indeed a great teacher, in the classroom, in the clinic, and in the laboratory. But it is through his classification of mental disorders, given to the world in successive editions of his textbook on psychiatry, that he has left his greatest mark on succeeding generations. At least since the sixth edition, published in 1899, this monumental work has been the sturdy backbone of psychiatric clinical classifications.

Throughout his life, Kraepelin devoted himself to the task of providing a solid nosological foundation for clinical psychiatry. Drawing on his own observations and those of his associates in psychiatry and related sciences, he accumulated a vast body of material and constantly arranged and rearranged it to form what he believed to be natural history groupings of mental diseases. At the time of his death in 1926, he was preparing the ninth edition of his textbook.

Table 1. Racial distribution of mental disorders

| Diagnosis | Actual number of cases | Rate per 1,000 persons examined, based on weighted number of cases | | |
|---|------------------------|--|-------|-----------|
| | | Total | White | Non-white |
| Total..... | 86 | 93.4 | 111.7 | 45.5 |
| Psychoses..... | 17 | 4.3 | 5.8 | .3 |
| Psychoneuroses..... | 51 | 52.6 | 62.2 | 27.5 |
| Psychophysiological autonomic and visceral disorders..... | 18 | 36.5 | 43.7 | 17.7 |

As might be expected, the psychoses were generally classified as moderate (30 to 50 percent disability) to severe (more than 50 percent disability), whereas the psychoneuroses and the psychophysiological disorders produced either no significant impairment or mild impairment.

Race and Economic Status

The psychoses, the psychoneuroses, and the autonomic and visceral disorders all were much more common among the white population than among the nonwhite (table 1). Several explanations for this distribution can be offered. For the psychoses, most of which were among the aged, the low prevalence among the nonwhites is probably attributable to the fact that the life expectancy of this group is less than 60 years. For the psychoneuroses and the psychophysiological disorders, the difference may be largely the result of bias on the part of the

examiners, who were in the white, middle or upper classes. It seems possible that a white examiner would be more likely to seek and therefore find psychological components in members of his own race than in those of another.

The distribution of the three categories by economic status provides a somewhat greater challenge. The prevalence of the psychoses was lower in the income group under \$2,000 than in the \$2,000-\$3,999 group, but, on the whole, these diseases appear to be associated with low economic status (table 2). How much of this is cause and how much effect we cannot say, but it is likely that both mechanisms are operative.

Of particular interest is the pattern of the psychoneuroses. Other surveys have found the psychoneuroses rising with increase in income, but here they decrease with an increase in income up to \$6,000 and then rise for the group making more than \$6,000. Hypotheses of etiology might best be discussed with relation to specific psychoneurotic diagnoses. From these data, however, it might be postulated that stress is greatest in the lowest and highest economic strata, in the former because of deprivation and the frustrations consequent to deprivation and in the latter possibly because of various social and cultural inconsistencies and stress consequent to attempts to maintain status.

For the psychophysiological disorders, there appears to be a definite trend toward an increase in prevalence with increasing income. Is this pattern a reflection of increased chronic

Table 2. Prevalence of mental disorders in economic groups

| Diagnosis | Actual number of cases | Rate per 1,000 persons examined, based on weighted number of cases | | | | |
|---|------------------------|--|---------------|-----------------|-----------------|------------------|
| | | Total ¹ | Under \$2,000 | \$2,000-\$3,999 | \$4,000-\$5,999 | \$6,000 and over |
| Total..... | 86 | 93.4 | 84.2 | 82.3 | 62.1 | 135.8 |
| Psychoses..... | 17 | 4.3 | 4.1 | 8.7 | 1.5 | 0.8 |
| Psychoneuroses..... | 51 | 52.6 | 80.1 | 55.4 | 13.4 | 62.5 |
| Psychophysiological autonomic and visceral disorders..... | 18 | 36.5 | 0 | 18.2 | 47.2 | 72.5 |

¹ Includes income not stated.

alcoholism and its relation to mental disorders, an interest he had long held, and he kept up a running battle with the "alcohol trade," which was particularly vociferous in Munich.

In 1925 he made a trip to the United States to collect material for comparative psychiatry, and the next year he was preparing for a research journey to India when he became fatally ill. Death came on October 7, 1926, but an era in the study and practice of psychiatry that he helped establish has not yet ended.

Mental Disease Prevalence In an Urban Population

brief In a survey in Baltimore, Md., approximately 10 percent of the non-institutionalized population were found to exhibit obvious mental illness. All types of mental disorders were more prevalent among the white population than among the nonwhite. At the same time, the psychoneuroses and, to some extent, the psychoses tended to be more common among low income groups.

The survey was part of a comprehensive investigation of chronic disease and resulting disability conducted by the Commission on Chronic Illness. The first step in this investigation was a household canvass of about 12,000 persons. The second step, which provided estimates of the prevalence of mental disease, consisted of clinical examinations of 809 individuals, who represented 62.6 percent of a selected subsample. The subsample was so designed that the data could be adjusted by the use of weights and the findings applied to the

original 12,000 participants. With the data appropriately weighted, distribution of the subsample by race, age, and sex was almost identical to that of the original sample. Race, age, and sex distribution of the original sample was similar to that of the total population of the city.

Physicians specializing in internal medicine or pediatrics who were associated with Johns Hopkins University performed the clinical examinations, in consultation with specialists if necessary, and recorded their findings concerning chronic conditions. A psychiatrist then reviewed all records containing any material that might possibly pertain to mental illness (about one-fourth of the subsample) and made the final diagnoses of mental disease.

This preliminary report concerns only the findings on psychoses, psychoneuroses, and psychophysiological autonomic and visceral disorders. A fourth category, "other mental psychoneurotic and personality disorders," is not included because the diagnoses are not considered very reliable.

Sex, Age, and Severity

Basic to the findings on prevalence of mental disease by race and economic status, which is of primary interest in this report, are the following previously reported findings:

The psychoses were twice as frequent among men as among women, although the difference is probably not significant since the number of cases was small. The psychoneuroses and the psychophysiological disorders, however, were more common among women. For the former, the adjusted rates per 1,000 persons examined were 68.0 for women and 35.6 for men. For the latter, they were 52.4 for women and 18.9 for men.

The psychoses rose precipitously with increasing age, from 0 in children under age 15 to 27.8 cases per 1,000 persons for those over 65. The psychoneuroses were almost uniformly distributed among the age groups over 15. There were no psychophysiological disorders in children under 15 or in persons over 65, but the rate for the group aged 15-34 (78.7) was twice as high as the rate for the group aged 34-64 (38.6).

Based on a paper by Benjamin Pasamanick, M.D., professor of psychiatry, Ohio State University College of Medicine, Columbus; Dean W. Roberts, M.D., executive director, National Society for Crippled Children and Adults, Chicago; Paul V. Lemkau, M.D., director, New York City Community Mental Health Board; and Dean E. Krueger, Columbia University School of Public Health, New York City.

these subjects were recorded and reviewed in exploring the subject's perceptions.

Personality Scores

As a whole, the 18-year-old subjects in 1955 had higher average personality scores than the 9-year-olds in 1946. It is assumed that this gain represents a general tendency for personalities to improve in that stage of life. About 50 percent of all of the scores showed no appreciable difference for better or worse. Nearly 20 percent of the scores suggested moderate improvement, and 8 percent indicated some decline, but not enough to give confidence in their statistical significance. As noted above, about 14 percent of the scores showed marked improvement and nearly 9 percent indicated an extreme decline, with assurance of statistical significance.

Those attending rural schools tended to show a relatively greater improvement in personality scores than those in urban schools. Also the number of times a student had changed schools was found to have a bearing on personality change. Of the 30 students with scores showing marked improvement, 16 had attended only one school in the interval, and 14 had attended two or more. Of the 30 whose scores indicated extreme regression, 6 had attended one school and 24 had attended two or more. The expectation for each group was that 11 would have attended one school and 19 would have gone to two or more. The conclusion is that changes in a school expose a student to a risk of unfavorable change in personality and that the stable student has a better chance of improving. A possible explanation is that mobile students may experience relative difficulty in finding friends who support their changing concepts of themselves.

Characteristics of Sample

About 15 of the deteriorated sample came from homes broken by divorce, death, or separation, or threatened by divorce; only 3 of the improved sample lived under such stresses. Normal expectation was that 9 in each group would come from such a background.

Of the improved sample, 23 had joined two

or more community organizations; only 12 of the regressive sample had such proclivities. For each group, the expectation was 17.5. It is suggested, however, that affiliation with social groups may be interpreted as a consequence rather than a cause of personality change.

Study of other external variables suggests that the personalities of youngsters in rural homes are more likely to improve than the personalities of those in a city; that chances of personality improvement are helped if the father's occupation enjoys prestige in the community; and that favorable personality changes tend to accompany young people in a family that is moving up in the world.

The findings support the conclusion that personality changes were affected more by personal interpretations of events than by external circumstances; that is, no known objective social or personal factor appears to exert a constant influence on all personalities exposed. Important though objective facts and events may be in a study of personality change, the critical factor appears to be the subject's interpretation of them. This does not mean that the subject can be studied in isolation from his cultural environment but only that it is necessary to fathom the individual's perception of that environment.

This approach sees personality as a person's varied and more or less enduring conceptions of himself together with all of his predispositions to act in ways consistent with those self-conceptions. Anchor points for those conceptions are the various statuses and positions which the subject occupies and the interpersonal situations in which he shares. His expected role in such situations is the core of his social personality, which is colored by his conceptions and evaluations of his own attributes, colored in turn by the reactions he observes in others.

From this point of view, the proper study of mental health includes not merely information about populations and group averages but also the factors that govern the individual's self-conceptions in relation to other persons. Material to cultivate such a study includes, in addition to responses to separate items in the personality inventory, the subject's written re-

tension and stress with income or is it possibly another indication of bias on the part of the examiners? Were it not for the increase in psychoneuroses in the highest economic stratum, it might be said that, whereas psychoneuroses are unacceptable in our culture, autonomic and visceral disorders are permissible. One might even tortuously evolve the hypothesis that the rich consider it fashionable to be neurotic, the middle class feel it is unacceptable, and the lower class are neurotic because of lack of sophistication and increased stress.

These explanations are offered merely as examples of the large number that immediately suggest themselves. They may actually be considered an indication of the dearth of knowledge in this area and of the long way still to go before we can say much about the etiology of mental disorders.

Personality Change In Adolescents

brief In 1946, 384 boys and girls, each about 9 years old and all from the third grade in schools of a semirural county in Ohio, took personality tests designed to appraise their mental health. In 1955, a group similar but 9 years older, including half of the subjects of the 1946 tests, repeated this experience.

This study had three major purposes: to determine rates and directions of personality change at this stage of life; to identify social factors associated with such changes; and to

seek bases for valid inferences about the causes of personality changes.

In essence, the study found that 14.1 percent of the 1955 scores moved significantly higher in favorable personality aspects, and 8.6 percent moved significantly lower. Rates and direction of change were not associated with sex, age, or IQ.

Factors significantly associated with personality change included place of residence, mobility, paternal occupation, broken homes, and degrees of participation in community organizations. Events with personal meaning for the subject, which affect the conception of one's self, appear to be immediate factors in personality changes. Nevertheless, in comparing statistical analyses with clinical observations, we concluded that ecologic or epidemiological studies that rely on group averages for a base have only limited utility in explaining causes of personality change, however useful they may be for suggesting hypotheses.

Comparison of the statistical approach with clinical or case studies of the subjects was an essential element of the investigation. Objective facts, descriptive of the culture and the age, sex, and IQ of the individual, were compared with case material that revealed the subject's perceptual and conceptual experiences. It was concluded that of the two methods, the clinical diagnosis of the individual in a social setting is superior for explaining personality changes.

Criteria of personality change were based on scores derived from the California Test of Personality, recorded in 1946 and 1955. Differences between the standard scores for the two applications were used to determine progress or retrogression. The differences, called discrepancy scores, are established by simple subtraction.

On the basis of such scores, five groups were established for analytical purposes: those with positive scores from 11 to 26; 6 through 10; minus 5 to plus 5; minus 6 through minus 10; and minus 11 through minus 22.

Two subsamples, 30 having the highest and 30 the lowest scores, were studied for acute contrast. From each of these two contrasting samples, 10 were selected at random, and another 10 from the subjects whose scores indicated slight change. Intensive interviews with

Based on a paper by A. R. Mangus, Ph.D., professor of sociology and of rural sociology and chairman of the Research Committee, Institute for Child Development and Family Life, Ohio State University, and E. Z. Dager, assistant professor of sociology, Purdue University. A detailed report of the study is contained in Social Factors in Personality Change, an unpublished doctor of philosophy dissertation by Dager, prepared at Ohio State University in 1956.

lack of any apparent relationship with occupation and the fact that the distribution of manic-depressive patients (though based on a far smaller number of cases) does show a significant relationship with socioeconomic status, lead us to feel that this interpretation is not sufficient.

2. Out-migration of lower status schizophrenics to larger cities may have occurred; the result would be to increase the rates of schizophrenia at lower class levels in those larger cities and to lower the rates at these levels for Hagerstown. Our data, unfortunately, do not bear directly on this possibility.

3. The high correlation between social status and rates of schizophrenia noted in larger cities may be the result of "drift" of incipient schizophrenics into deteriorated areas where the unsuccessful tend to collect. Hagerstown lacks such "collecting areas" and our data show an absence of downward drift.

4. There may be a relationship, previously unsuspected, between the size of a city and the degree to which rates of schizophrenia correlate with such indexes of socioeconomic status as area of residence and occupational level. While other alternatives cannot be ruled out, we should like to explore this one in some detail. A metropolis like Chicago produces strikingly high correlations. Smaller cities, such as Peoria, Kansas City, Milwaukee, and Omaha, produce far lower correlations, and a city as small as Hagerstown produces no discernible correlation at all. This suggests that the social phenomena indexed by occupation and area of residence in Hagerstown may be quite different from those indexed by these same items in a larger city. In any sized community, area of residence and occupation tend to be among the primary indexes of social status, but perhaps more than this is involved. It appears that the class structure of Hagerstown is not as highly differentiated as that of larger cities—in particular, there appears to be a relative absence of extremes; and social interaction appears to be less dependent on class position.

Residence and Occupation

Hagerstown has its elite neighborhoods and its rundown neighborhoods, as has any older

city of this size. But with one or two exceptions, these are rather small neighborhoods, which constitute parts of enumeration districts, or overlap several enumeration districts. This means that different districts do not offer as strong a contrast in living conditions as sections in a larger city. There are slum areas, but they are not large, nor are they as economically depressed as the skid rows of larger cities. The children attending a given public school represent, for the most part, a fair variety of residential settings.

Occupational status may likewise have a rather different meaning for social interaction in a community the size of Hagerstown than in a larger city. Unquestionably, status considerations are fully as important in social interaction here as elsewhere. But our observations lead us to believe that several nonstatus factors influence social interaction to a greater extent here than in the metropolis. These include the persistence of school associations into adult life and length of residence, and of one's family's residence, in the community. Furthermore, membership in one of Hagerstown's several tightly bound religious groups, including the Mennonite, the Brethren, and a score of small fundamentalist churches, may imply as much about an individual's social participation as does his occupational status. Again, it would appear that we do not have the extremes that are found in larger cities—the professionals and proprietors are small operators; the blue-collar workers are on the whole more integrated into neighborhood and community.

This interpretation is frankly conjectural. It was not our primary aim in this research to study local social structure. We naively assumed that we should find the usual correlations, and we wished to examine these in the context of individual life histories of patients and controls. Perhaps at some later date we shall return to this community and secure the data needed to test the hypothetical interpretation offered above. Whether we do so or not, however, we feel that our negative findings pose a question to which much more attention might fruitfully be addressed: In the constellation of attitudes, values, behaviors, and relationships that are generally indexed by

sponse to incomplete sentences, autobiographies, recorded interviews, and answers to questionnaires.

Schizophrenia and the Social Structure of a Small City

brief According to many studies made over the past 20 years, the distribution of schizophrenia in large population groups is not random, but is associated with low socioeconomic status. Results of a study of mental illness in Hagerstown, Md., a city of 36,000 population, unexpectedly diverge from these findings.

Hagerstown is an industrial and trading center in the northwestern part of Maryland, located at the junction of three major railroads, a major east-west highway, and a less important north-south highway. The city has a large aircraft plant and several smaller factories. It is an old and settled community. Although the war years brought an influx of workers to the aircraft plant, the majority of them came from nearby counties of Pennsylvania and West Virginia and did not differ culturally from the old inhabitants. The population has been relatively stable in recent decades, increasing only about 1 percent per year since 1920. The population is remarkably homogeneous—predominately white, Protestant, and native-born.

A report of a major phase of the Hagerstown mental illness study, the differences between schizophrenics and normal persons in relation to social experiences in childhood and adolescence, has already been published. Data on the distribution of hospitalized schizophrenic patients in different population strata are presented here.

Basic background data were secured for all

Based on a paper by John A. Clausen, Ph.D., chief, Laboratory of Socio-Environmental Studies, and Melvin L. Kohn, Ph.D., chief, Section on Community and Population Studies, National Institute of Mental Health, Public Health Service.

persons from Hagerstown and the surrounding county who were first admitted to any public or private mental hospital within the State of Maryland in the years 1940 through 1952. Detailed data from hospital records were secured for all such individuals diagnosed in the categories schizophrenia, manic-depressive psychosis, involutional psychosis, or paranoia. This provided 222 cases for the whole county, 112 of them from Hagerstown. Of these cases, 128 were diagnosed as schizophrenia—62 from Hagerstown itself. The rate of schizophrenia in Hagerstown (19.4 per 100,000 population) is lower than for Chicago, about the same as for Providence, R. I., and a bit above that reported for Austin, Tex.

To secure relatively stable ecologic rates of so infrequently occurring a phenomenon as schizophrenia, rather large population segments must be used. For Hagerstown, with a total population of only 36,000, we had to combine the 50-odd census enumeration districts into a small number of aggregate areas. We used a rent-value index of housing as the basis for grouping enumeration districts into five broad strata.

Rates of Occurrence

The average annual rates of first admissions for schizophrenia do not show any significant differences among the five socioeconomic strata. This finding is divergent from those of ecologic studies made in larger cities.

Evidence of nonassociation between rates of schizophrenia and socioeconomic status is reinforced by our finding that rates of schizophrenia do not vary significantly by occupational group. Neither is there any evidence of abnormal upward or downward social mobility in the occupational or residential histories of these schizophrenic patients.

Several alternative interpretations of these findings have some plausibility, though our data do not permit a firm choice among them:

1. Chance fluctuations in rates, to be expected when the number of cases is small, and the difficulty of delineating homogeneous areas in a small city may obscure an actual concentration of schizophrenia in the lower socioeconomic segments of the population. However, the

The three categories represent a descriptive classification scheme and not a diagnostic taxonomy.

Respondents in the "extreme disturbance" and "serious disturbance" categories correspond to patients in private and Veterans Administration hospitals; respondents in the "marked disturbance" category correspond to patients in outpatient clinics and under the care of private therapists.

It is considered that a single interview, although of 2-hour duration, probably would not suffice to identify all paranoids, psychopaths, and sex deviants, or the less advanced alcoholics and drug addicts. Therefore, the estimates of mental morbidity in the sample population probably err in the direction of understatement.

Patient Census

A 1-day census, or prevalence enumeration, was made of all Midtown residents under treatment for mental pathology on May 1, 1953, by private psychiatrists and clinical psychologists, outpatient clinics, State and Veterans Administration hospitals, and licensed private hospitals of New York and other States.

Unlike the sample survey, which included only persons aged 20-59 years, the patient census included individuals of all ages. Midtown rates for patients in public and private hospitals are not strikingly different from the rates found in a similar study by Redlich and Hollingshead in New Haven, Conn., on December 30, 1950. When outpatients are included, Midtown has a clinic patient rate 2.5 times higher and a private patient rate 4 times higher than New Haven. From these figures, it would appear that the Midtown mental morbidity prevalence is about 60 percent greater than that of New Haven.

However, the data may reflect the amount of treatment facilities accessible to each population rather than the true prevalence of mental disorder in the community. When differences in numbers of State-supported hospitals in New York and Connecticut, in numbers of local clinic facilities, and in numbers of psychiatrists and clinical psychologists are taken into consideration, there is little difference in

outpatient mental morbidity rates between Midtown and New Haven.

These facts do not rule out possible real differences in the prevalence of lesser mental disorders which are susceptible to outpatient treatment, but they do emphasize that any real difference cannot be estimated from outpatient rates. If the treatment facilities available are far below the level of demand, intercommunity differences in mental morbidity rates may primarily reflect differences in treatment capacities rather than variations in the prevalence of mental pathology.

Prevalence of Mental Illness

The 398 mentally disturbed individuals found in the Midtown sample population, representing 23.9 percent of the sample population, were classified as follows: extreme disturbance, 55 (3.3 percent); serious disturbance, 125 (7.5 percent); and marked disturbance, 218 (13.1 percent). Ten of the extremely disturbed respondents are in hospitals; 5 are receiving ambulatory treatment; 1 in 5 has had psychotherapy but is still, or again, extremely sick; and roughly half have never received psychiatric treatment. In the seriously disturbed category, only 1 in 25 patients is currently receiving therapy, 1 in 4 has had previous treatment, and over two-thirds are not known to have had psychotherapy. Those in the marked disturbance category had histories similar to those in the serious disturbance category.

The only available yardstick against which to evaluate the 23.9 percent rate of psychiatric morbidity in Midtown is the combined rate of Selective Service rejections and military service discharges for psychiatric reasons among men of military age during World War II. When all unrecorded psychiatric categories of men of military age are taken into consideration, the total rate of mental morbidity is probably not far below 20 percent; among Midtown males in a similar age range the combined rate for extreme, serious, and marked mental disturbance is 19.9 percent.

Only 7.5 percent, 3 in every 40, of mentally disturbed respondents in the Midtown sample are receiving psychiatric care at any one time. Only 2.5 percent are hospitalized, 5 percent are

socioeconomic status—by occupation, education, area of residence—what are the factors that are crucially related to the development of schizophrenia?

Mental Disorders In a Metropolis

brief

The number of persons receiving psychiatric treatment, hospital or ambulatory, in a population as a whole or in its subgroups, offers no indication of the relative magnitude of total mental morbidity in the community. A Cornell University interdisciplinary research team reached this conclusion after making a patient census, or prevalence enumeration, and a sample survey of the population of a well-defined residential area of New York City designated as Midtown, with a population of 172,000.

The population of Midtown is 99 percent white and is about equally divided among natives of New York City, American-born immigrants, and foreign-born immigrants, principally from seven countries overseas. In population density and socioeconomic status Midtown resembles the "gold coast and slum" areas that adjoin the central business districts of other large American cities.

Sample Survey

A random sample was selected from the 109,000 Midtown adults in the age group 20-59 years. Fifteen in every 1,000 persons in the sample, or a total of 1,660 individuals, were interviewed.

The sample was psychiatrically screened in

Based on a paper by Leo Srole, Ph.D., visiting professor of sociology (social psychiatry), and Thomas Langner, Ph.D., research associate (social psychiatry), department of psychiatry, Cornell University Medical College, New York, N. Y. The study was under the direction of the late Thomas A. C. Rennie, M.D., professor of psychiatry (social psychiatry) Cornell University Medical College.

single home interviews. The interviewers were psychiatric social workers, caseworkers, clinical psychologists, and social scientists working in the field of ethnopsychiatry. These interviews were based on a questionnaire of about 400 items on physical health history, personality symptoms and functioning, childhood history, interpersonal associations, and other areas of current life functioning.

The 110 questions on mental health were adapted in part from items in the Army's Neuropsychiatric Adjunct and the Minnesota Multiphasic Inventory. These items were re-validated by the staff clinical psychologist on a group of known mentally ill persons and on a control group from the Midtown area. Other questions were newly constructed on the basis of extensive clinical experience.

The questions covered symptoms commonly associated with psychosomatic disorders, overtly registered signs of tension, anxiety, inadequacy, phobias, depression, and symptoms related to schizoid withdrawal, paranoid suspiciousness, compulsive rigidity, and psychopathic immaturity; problems in the performance of key social roles; and history of nervous breakdown and consultation with or treatment by a psychotherapist.

Two staff psychiatrists made independent mental health evaluations of each respondent from replies to the mental health items, from interviewers' records of spontaneous, significant comments of the sample respondents, the interviewers' own observations and impressions, and information on history of psychiatric treatment and involvement in social agencies.

Respondents were classified in a series of categories. Among these were "extreme disturbance," that is, socially incapacitated individuals or those functioning in the social sphere with great difficulty; "serious disturbance," those with serious symptoms who have some difficulty in functioning socially; and "marked disturbance," those with marked symptoms and some difficulty in functioning socially. Mental disturbance was defined in the operational terms of the many details obtained from the individual respondent and from outside sources as these details were independently weighed in toto by the psychiatrists.

integration, abnormal behavior and neurological patterns, and of physical examination results. Also recorded were maturity levels for the various fields of behavior, a diagnosis of neurological status, intellectual potential, and a prognosis for future development.

Almost all of the examinations were performed by a pediatrician who was not told whether the infant was premature or full-term. The final step was a review of the history obtained by the other interviewer for any factors, such as severe convulsions, that might modify the prognosis.

The neurological status was an appraisal of the integrity of the nervous system. This status was expressed in terms suited to the field of infant neurology. The intellectual potential consisted of a clinical estimate of intelligence, taking into account the level of development and quality of behavior. Intellectual potential is concerned with prognosis; it implies that if nothing happens to damage the infant organically or psychologically his future development should be at essentially a constant rate.

General developmental quotients assigned the infants were usually the same as the adaptive maturity quotients except that they took into account clinical factors in predicting future development. On the average, the developmental quotient was less than one point higher than the adaptive quotient.

To give a representative picture of the surviving infant population of Baltimore, the distribution of general developmental quotients was adjusted for differences in incidence and mortality between the birth weight groups, using incidence and mortality figures for Maryland in 1952. Further adjustment was made for economic status and for race. It was found, however, that neither the education of the parents, their economic status, nor their race had led to any important differences in distribution of general developmental quotients.

Mean developmental quotients and standard deviations indicated that as the birth weight of the infant decreased the mean developmental quotient was lowered for both whites and nonwhites. Significant differences appeared between the smallest premature infants with

birth weights below 1,500 grams and the heavier infants. When the distribution of general developmental quotients was adjusted for birth weight, race, and economic status, there were no significant dissimilarities in distribution between whites and nonwhites.

Most important among the findings is that more than 90 percent of the general developmental quotients occur between 90 and 120. This differs markedly from findings previously reported in older children.

Validity of Infant Appraisal

Up to the present, literature on infant evaluation has held that performance in infancy has little bearing on later function, that correlations in examinations vary from plus .2 down to small negative correlations. It is also maintained that about 60 percent of reexaminations differ by more than 20 points from initial tests.

However, in a reexamination of almost 300 infants in the Baltimore study at the age of 3 years, the correlation between the examinations was plus .5 for the entire group, and for cases involving intellectual or neurological abnormality, plus .75. In another study of 53 infants examined again at age 7, the correlation was found to be .5. Similar findings were made in a study of 100 infants seen at the ages of 16, 28, and 40 weeks and 18 months, where the correlations ranged from .5 to .75. As for actual change in the developmental quotient in the group that was part of the study of prematures, 74.2 percent changed less than 15 points, and 52.9 percent less than 10 points between the first and second examinations. These highly significant correlations validate the infant appraisal; they demonstrate that the state of the central nervous system should influence even learned behavior in a predictable fashion, provided gross changes do not occur in the milieu of the child to alter major variables of functioning.

Influence of Environmental Factors

Although obviously related to neural integration, the intelligence quotient of older children is influenced by more environmental factors than affect the intellectual potential as

currently receiving outpatient treatment, 20 percent are ex-patients, and 72.5 percent presumably have never had psychotherapy.

Data from both the patient census and the sample survey indicate that there is a positive correlation between socioeconomic status and amount of psychiatric treatment received. Downward on the socioeconomic continuum, mental morbidity increases and psychiatric treatment decreases. It would be seriously misleading, therefore, to use the socioeconomic composition of the small current patient population of Midtown as a basis for generalizing about the socioeconomic composition of the far larger number of mentally sick persons in the area who are not receiving treatment.

Broad generalizations from the body of evidence obtained in the Midtown study must be drawn with appropriate caution. It can be firmly stated, however, that for adequate measurement of magnitudes of mental morbidity, epidemiological research will have to shift its focus from the patient population to the community population as a unit for study.

Intellectual Potential In an Infant Group

brief The relative influence of nature and nurture in intellectual functioning is a perennial problem in psychology. Almost universal is a hard core of belief in the inherent variation of intelligence, but recent work focused on the lower end of the intelligence curve shows that an increasing number of conditions previously considered hereditary are actually caused by environmental influences.

Based on a paper by Hilda Knobloch, M.D., Dr.P.H., and Benjamin Pasamanick, M.D. Dr. Knobloch is associate professor of pediatrics, Ohio State University College of Medicine, and director, clinic of child development, Children's Hospital, Columbus, Ohio. Dr. Pasamanick, professor of psychiatry at the same medical college, is director of research at the Columbus State Institute of Psychiatry.

Another basic controversy centers on the definition of intelligence itself or on that which is being measured by various intelligence tests. About the infant age group particularly are most questions raised on the validity of intelligence tests. We emphasize that behavioral development can reveal the degree of maturity and integrity of the nervous system. Later performance, though more influenced by learning, is not independent of that system. There is a substrate of neural integration permeating the behavior of each individual; it is the physiological organization that is the foundation for all learning.

A study of premature infants born in Maryland in 1952 produced findings which may be applied generally. One phase of this study, which is described here, was designed to compare a premature group in Baltimore with their full-term controls.

Study Methods

The study group of 992 infants, 500 prematures and 492 matched full-term controls, were 85 percent of an original 1,170 scheduled for examination. The remaining 15 percent represent either refusals or those who could not be located. Age at examination ranged from 34 to 69 weeks, with 75 percent seen at 39 to 41 weeks. To make allowance for the estimated amount of prematurity, the chronologic age of the prematures was corrected.

Information was obtained from the mother to cover the infant's neonatal adjustment, illness, neurological symptoms, emotional behavior, and some parental history.

Following the procedure outlined in Gesell and Amatruda's Developmental Diagnosis, the Gesell examination began with another brief interview for information on the infant's behavior not touched on by the previous interviewer but needed for the Gesell developmental schedules. During the examination, standard items were adapted to handicapping conditions or unusual emotional responses. A dictated recording of the infant's behavior described how he used the materials and his neuromotor patterning as he handled them.

After the physical examination, a special form was filled out to give scaled judgments of

effects, which modifies his behavior and, in the absence of organic brain damage, makes one individual significantly different from the next.

Behavior Disorder Patterns In a Deaf Population

brief A deaf population affords an unusual opportunity for investigating the effect of severe sensory deprivation on personality integration as well as susceptibility to mental disorder. Total deafness early in life interferes with ordinary communication, learning, emotional maturity patterns, and socialization, and, because they are isolated from the hearing world in varying degrees, the deaf form groups which cut across geographic, ethnic, cultural, socioeconomic, and other conventional boundaries.

Demographic Factors

Demographic analysis of a representative deaf population should provide valuable information about the relationship between deafness and difficulties in communication and social interaction; frustrations arising from intrafamily organization, residential school living, inadequate educational or vocational opportunities, or limitations on the choice of a mate; and constriction of emotional and intellectual maturation.

Some general points to be considered in a demographic study are:

1. Types of mental disorder more likely to occur in a deaf population than in a hearing one.

Based on a paper by John D. Rainer, M.D., associate research scientist, and Franz J. Kallmann, M.D., principal research scientist, New York State Psychiatric Institute, Columbia University, New York, N. Y. This report is part of a study aided by a grant from the Office of Vocational Rehabilitation of the Department of Health, Education, and Welfare.

2. Differences between deaf and hearing populations in the expression, recognition, or persistence of clinical symptoms.

3. Amount and quality of personal guidance and psychiatric treatment given deaf persons compared with that given hearing persons.

4. The ability of a deaf population to form a stable subgroup of society with which each member can readily identify himself or the optimum degrees of adjustment the deaf are able to attain on different levels of intellectual capacity and personality integration.

5. The effect of deafness upon psychological functions, emotional responses, and the level of emotional immaturity.

A fact which is generally overlooked in the psychodynamic appraisal of the deaf is that many deaf persons, especially those whose parents are deaf, show a childlike trust in their fellows rather than an overcautious suspicion. Behavioral imperfections of deaf persons in social and sexual relationships may often be due to inexperience rather than to a basic personality deficiency, and their consistently high divorce rate may be as much a reflection of unusual social, cultural, and economic pressures as of friable personal loyalties or immature personality features.

Genetic Factors

A unique characteristic of deafness is its tendency to cluster in families. It has been estimated that nearly one-half of the cases of deafness are genetically determined, that about 47 percent of the deaf population of America marry, and that the majority of deaf persons marry deaf persons. Deaf couples tend to have about half as many children as comparable hearing couples.

The most pertinent points in appraising the genetic aspects of deafness are:

1. Some of the deafness classified as non-genetic in origin may include forms of environmentally induced deafness actually based on a genetic predisposition to deafness.

2. Different genes may cause similar syndromes of early deafness, and variations in specificity of action of a certain gene may depend upon the lapse of time since its appearance in any one family line.

measured in infancy. A lower score in a later examination may be the result of many environmental factors, but a higher score can only be the result of learning. A comparison of two large samples using the Stanford-Binet test with findings of the Baltimore investigation may help measure the influence of environment on intelligence test scores (see table). One study involves 873 children in Scotland tested by Macmeeken when they were between 8 years 11 months and 11 years 9 months; in the other, about 3,000 children between 2 and 18 years of age in the United States were tested in making the revision of the Stanford-Binet test. This sample's deviation from a more representative population is not clear, children in institutions having been excluded. Because the children in both these samples are older, it is likely that those with severe defects died too early to have been included in the group.

Distribution of intelligence quotients reported in literature compared with distribution of general developmental quotients in Baltimore infants, 1952

| Quotient | Cumulative percentage | | |
|--------------|-----------------------|----------------------|----------------|
| | Baltimore infants | Macmeeken (Scotland) | Stanford-Binet |
| <35----- | 0.1 | 0.0 | 0.0 |
| 35-44----- | .1 | .2 | .4 |
| 45-54----- | .2 | .9 | .9 |
| 55-64----- | .9 | 1.8 | 2.2 |
| 65-74----- | 1.4 | 4.5 | 5.4 |
| 75-84----- | 1.8 | 14.4 | 14.4 |
| 85-94----- | 9.6 | 39.6 | 33.6 |
| 95-104----- | 54.6 | 66.1 | 56.7 |
| 105-114----- | 88.7 | 83.6 | 78.1 |
| 115-124----- | 96.7 | 93.0 | 90.9 |
| 125-134----- | 98.6 | 97.5 | 96.2 |
| 135-144----- | 99.6 | 99.3 | 98.1 |
| 145-154----- | 99.8 | 99.7 | 98.7 |
| 155-164----- | 99.8 | 99.9 | 99.3 |
| 165-174----- | 99.8 | 99.9 | 99.8 |
| 175+----- | 99.8 | 99.9 | 100.2 |
| Unknown----- | 100.1 | 99.9 | 100.2 |

The cumulative percentage distributions are similar for both of these samples, but are in sharp contrast with our findings. The chief difference lies in the group with quotients below 85, in which both samples show about 14 percent of the cases compared with 1.8 percent for the Maryland infant group. Data from

the Stanford-Binet revision group show that as the child's age increases the percentage with quotients below 85 grows. The increase in the percentage of children with quotients under 80 occurs largely among the upper grade retardates, those with quotients between 55 and 70 who are usually considered inadequate genetically. There is also the segment of from 70 to 85 thought part of the normal variation on the basis of inferior hereditary endowment.

These observations support the hypothesis that intelligence used in later life is greatly influenced by learning, and that there are life experiences tending to limit opportunities for acquiring the kinds of information that the tests seek to evaluate. These experiences are not only physiological but sociocultural as well, as was brought out by the Klineberg studies on changes in Negro intelligence with geographic location and by followup studies showing favorable adult development of morons.

Although our study of premature infants shows that socioeconomic elements have little effect on the distribution of general developmental quotients in the infant group, findings from a current study of the group at 3 years of age indicate that such environmental forces are beginning to exert their influence. In this re-examination which is now in progress, the average developmental quotient for white controls has risen significantly while for nonwhites it has decreased.

Comment

The range of normal human potential is much narrower than has been thought. Those with an innate intellectual potential below normal are indeed few and the majority, if not all, appear to have had organic brain damage. Gradually, as more factors tending to damage neural integration are isolated the distribution will be narrowed further. Man has apparently reached the stage in evolution where change does not take place on the structural level. At the present time the most useful theory is that while man's fundamental structure and therefore his basic functioning are genetically determined, it is his sociocultural milieu, with its biological and psychological

ing 47.5 percent of the total, difficulties in communication obscure the usual diagnostic criteria. Only in the more advanced stages of schizophrenia do catatonic, hebephrenic, or paranoid symptoms in the deaf show no significant differences from these symptoms in persons who can hear.

Intensive genetic and developmental studies among deaf persons with indeterminate deviations in behavior are needed. Some questions to be answered are:

1. What are the signs of early, latent, or "pseudoneurotic" schizophrenia and do they fall into a definable pattern?

2. What is the significance of behavior forms resembling mental defect and of impulsive or psychopathic syndromes? How are they related adaptively to early total deafness and what connection have they with schizophrenia?

3. Can deafness protect against rather than promote manifestations of schizophrenia?

At present it is not clear whether a stressful condition such as early total deafness causes a significant change in the prevalence of schizophrenia or, if it does, whether the change is toward an increase or a decrease in the prevalence of the disorder.

Previous Nervous Illness And Pregnancy

brief A possible interrelation between nervous disorders and poor physiological response to the demands of pregnancy is suggested by the results of a study of 1,570 clinic patients delivered on ward service at the Philadelphia Lying-in Hospital between 1947 and 1953.

With the exception of patients with chronic heart or kidney disease, essential hypertension, syphilis, or hyperemesis gravidarum, and of those whose pregnancy terminated in a multiple birth or abortion, all married women who

registered at the hospital and who made their first prenatal visit before the 17th week of gestation were isolated in the study.

A special record of nervous illnesses was made by a clerk independently of the data recorded by the examining physician. The only information requested was whether or not the patient had had a nervous breakdown and, if so, the date. Many patients said their illnesses were "not a breakdown." They reported "verge of a breakdown," "very nervous," or just "nervousness," even though they were under medical care for "nerves." Their only common characteristic was illness which had been diagnosed as nervousness or in which nervousness was a dominant symptom. A few illnesses were recent; others had occurred more than 10 years previously; three-fourths had occurred within 5 years of the current pregnancy.

There was no followup by a professionally trained person to seek further information, and no attempt has been made to classify the nervous illnesses reported or to screen out those that were not primarily nervous disorders.

A history of nervous illness was reported by 81 women, 62 white and 19 Negro, or 5.9 and 5.3 percent of the white and Negro women, respectively.

Stressful events such as premarital pregnancy, early marriage, desertion and divorce, and death of an infant or other member of the family were reported as associated with the nervous illnesses by about 40 percent of the women, and the records suggest such associated events for many others who did not mention them. It was impossible to determine whether the event precipitated the illness or the illness precipitated the event.

The ages of the women in the study varied from 15 to 45 years, with a median age of 25 years. Among white women, the highest rate for history of nervous illness (7.9 percent) was in the group aged 25-29 years, declining thereafter. The tendency is the same for Negroes, although the rates are erratic because of the small number of patients. Probably the percentages of nervous illness are lower for women in the older age groups because the older women failed to report illnesses that occurred a long time ago.

Based on a paper by Dorothy G. Wiehl, M.A., Katharine Berry, M.A., and Winslow T. Tompkins, M.D., Milbank Memorial Fund, New York, N. Y.

3. Epidemiological emphasis should be placed on evaluation of the mode and degree of transmission of a given genetic component as well as on the cultural factors of mate selection. The frequency of deafness in the population will be increased by consanguineous marriages between persons with normal hearing who are carriers of recessive genes which have a high degree of penetrance, as well as by marriages between two deaf persons. Ordinarily, the expectancy of deafness among children of parents with a gene-specific type of deafness is 100 percent. However, even these parents may have both hearing and deaf children if they carry mutant genes of a different variety or genes with a limited degree of expressivity.

The complex interaction of genetic and non-genetic influences in the epidemiology of disordered behavior patterns in the deaf has been studied in a pilot project begun in April 1955 by the department of medical genetics of the New York State Psychiatric Institute. The results of studies of two representative population samples will make it possible to combine cross-sectional and longitudinal methods of investigation from a demographic as well as a genetic standpoint.

One sample was made up of the total deaf population of New York State aged 10 years and over, including a subgroup composed of all deaf patients in State institutions for the mentally ill and the mentally retarded. The rate of deafness found to date among the general population was 0.079 percent; among the institutionalized population, 0.24 to 1.56 percent. The high percentage of deaf patients in institutions may be due to the more complete census of deaf persons in hospitals than in the general population or to the fact that the deaf need more institutionalization and a longer hospital stay than those who can hear.

In New York State, among children over 10 years of age, the percentage of deaf students who attend special schools is slightly below the percentage of students in the general population, probably because most special schools are residential. There is no law compelling attendance at residential schools, and many deaf children remain at home or try to go to regular schools.

The second sample population studied was

made up of twins of any age from the eastern part of the United States, including the population of New York State. The histories of four pairs of twins, two fraternal and two identical, are summarized below.

The first pair of fraternal twins were girls, one deaf, the other schizophrenic. The deaf girl has always been less mature physically and emotionally than her twin, but she does well at school and shows no evidence of schizophrenia. The parents are first cousins with normal hearing. A brother of the mother is schizophrenic. Both of the second set of fraternal twins are totally deaf and mentally retarded, with intelligence quotients between 60 and 70. They come from a large family with no history of early deafness. Their personalities are considerably different but they have reached the same grade at a school for the deaf.

One pair of identical twins are 4-year-old girls. Both parents and an older sister are deaf. Although only one twin is deaf, they are strikingly similar in behavior, intelligence, and social maturity. Both are considerably retarded verbally. Measured on nonverbal scales, their intelligence is normal and their social maturity is advanced. The second pair of identical twins are 60-year-old men who have been deaf since birth. Their parents and siblings have normal hearing. The twins graduated from a school for the deaf and both have been successful in the printing trade. Their wives are deaf, but the cause of their deafness apparently is nongenetic since the children of both couples have normal hearing.

Mental Hospital Patients

Among 215 deaf patients in mental hospitals, 25.6 percent were classified as "psychosis with mental deficiency," and most of them were in the "episode of excitement" subcategory. The high percentage of patients with this diagnosis may be due in part to the fact that many mentally defective deaf persons become psychotic and require hospitalization. Also, it may be assumed that, had they been hearing persons, many deaf patients labeled as mentally retarded would have been placed in a more precise psychiatric classification.

Among schizophrenic deaf persons, constitut-

percent of those without nervousness were in labor less than 6½ hours compared with 17 percent of the nervous patients.

Housing Environment And Mental Health

brief In 1954 the Baltimore Study of Health and Adjustment began a 5-year longitudinal study of the influence of housing environment on the mental and physical health of 1,000 families in a large eastern city. The general study plan, which is experimental in design, was to locate a population that was known to be moving from "bad" to "good" housing. This constituted the "test" group. Measurements were made on this group prior to the move and are expected to continue until midyear of 1958. In order to evaluate the effects of housing on any changes that took place, a "control" group, not moving, was planned which would be matched carefully with the test group on many relevant characteristics and which would also undergo repeated measurements.

The research design was put into effect through the cooperation of the local housing authority. A test group of 400 families was selected from among 800 families, all of whom were to move from the slums to a new housing project, and a control group of approximately 600 families, also taken from applicants in the housing authority files, was matched as closely as possible to the test families.

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Based on a paper by Daniel M. Wilner, Ph.D., associate professor of biostatistics, School of Hygiene and Public Health, Johns Hopkins University, and director of the Baltimore Study of Health and Adjustment, and Rosabelle Price Walkley, B.A., research associate in biostatistics and assistant director of the Baltimore Study of Health and Adjustment. Details of the background of this study and a description of the study design and study methods were published in the American Journal of Public Health for June 1956.

study. Our test families have been living under rehoused conditions for approximately 18 months. The data already collected are only now being processed and are as yet too incomplete to throw light on our hypotheses.

One of the byproducts of this research will be the comparison of findings from the longitudinal study with findings from an investigation of a given population at a single point in time—the cross-sectional study. The controlled longitudinal study has, of course, known theoretical advantages over the cross-sectional study in the possibilities of sorting out the effects of a single factor—like housing quality—on sickness and health, and in recent years funds have become increasingly available to carry out the considerably more expensive long-term studies. The comparison of findings between longitudinal and cross-sectional studies covering the same ground is valuable at this time because it will be possible, using identical measures, to test the efficacy and soundness of conclusions to be drawn from each type of investigation in a concrete case.

The comparison between the two types of studies is possible in our case because the data we have collected regarding both test and control groups at the outset of the study parallel very closely the kinds of data collected in the traditional cross-sectional study; at that time the test families had not yet moved, as a bloc, into "good" housing, and were, by and large, living in the same general neighborhoods as were the control families. Thus, we may combine all 1,000 families into a single group without considering for the moment which are test and which are control families. To complete the model of the cross-sectional study, we may now compare the physical and mental health of the relatively well-housed and the relatively ill-housed within this "single" sample of families.

In this paper, we will present some results dealing with the relation of housing to mental health and adjustment of families derived from the cross-sectional aspects of the study, and we will have occasion to discuss some difficulties of interpretation in this type of study. Furthermore, even though our longitudinal data are as yet incomplete, we are in a position to point out some of the apparent ad-

Among previous pregnancies of the white multigravidae, the rates of premature births, perinatal deaths, and abortions for patients reporting nervous illness did not differ significantly from those rates for the total group of white multigravidae. For Negro women, the neonatal death rate among previous births was significantly higher for those reporting nervous illness than the rate for all Negro multigravidae; the stillbirth rate was about the same for both groups; and the rate for premature births was higher among women reporting nervous illness, but the difference was not significant.

The 81 women with a history of nervous illness had 94 pregnancies during the 5-year period; and the current pregnancy records are for 72 white prenatal patients and 22 Negro prenatal patients.

Prenatal Complications

In the total group of patients, there was no statistically significant difference between the percentages of patients with and without nervous illness who had nausea and vomiting early in pregnancy. Among women under 25 years of age, however, the percentages were statistically significant; 20 percent and 8 percent respectively had severe nausea and vomiting.

The percentages of patients with nausea and vomiting late in pregnancy were also significantly higher in nervous women than in women who were not nervous, 39 percent and 18 percent, respectively. Late nausea and vomiting occurred most frequently in older women and in women under 25 years of age. Perhaps the higher rates for the nervous group indicate that they are less able to adjust to pregnancy or that emotional anxiety increases as pregnancy progresses.

Other than nausea and vomiting, prenatal complications or signs of metabolic imbalance were no more frequent among the 94 patients with a history of nervousness than among patients with no such history. No cases of eclampsia or preeclampsia were diagnosed in these patients; the frequency of edema or elevated blood pressure was approximately the same for both groups, and there were no sig-

nificant differences in the amount of weight gained.

Two of the 94 patients with a history of nervous illness (2.1 percent), both white, had marked symptoms of nervous illness during the prenatal period.

Labor and Delivery

Prematurity is an important public health problem, and the possible relationship between emotional status and premature births is of special interest. For the white population, premature births (birth weight 5.5 lbs. or less) were much more frequent among patients with nervous illness than among those with no history of such an illness, 8.3 and 4.3 percent, respectively. In the nervous group, all premature births were to women under 30 years of age and were first or second births. Under 30 years of age, for nervous women the premature birth rate was 10.3 percent compared with 3.9 percent for those who were not nervous.

The small number of Negro women in the study does not permit a reliable evaluation of premature births among this group.

Delivery more than 2 weeks after the expected date occurred more frequently among white patients with a history of nervousness than among other white patients; among Negro patients there were few late deliveries and no differences associated with nervousness.

Among white patients, cesarean section was more frequent for those with a history of nervousness than for other patients. All but one nervous patient delivered by cesarean section had had a previous cesarean section. Only one Negro patient, a multipara who had had no previous section, was delivered by cesarean section.

Many multiparae with a history of nervousness had a longer labor than did those without nervousness who had had the same number of previous births. Length of labor differed chiefly for the white patients. Among white patients who were having their second baby, a very significantly higher percentage of those with nervousness had a labor lasting more than 24 hours, 22 percent compared with 3 percent of those who were not nervous. For patients who had had two or more previous births, 44

percent of those without nervousness were in labor less than 6½ hours compared with 17 percent of the nervous patients.

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vantages of the longitudinal over the cross-sectional study; we will also illustrate some of the grave difficulties we have encountered in carrying out a longitudinal study.

The Cross-Sectional Study

As the basic independent variable of the study, we have been making extensive measures of the housing environment of our families. From these extensive measures we have so far developed only a fairly crude index of housing quality, although we expect in the future to amplify and refine the index. The present crude index is based on nine factors, such as presence or absence of toilet or hot running water, sharing of kitchen or bathroom, vermin infestations, extent of crowding, and general structural condition.

To illustrate the cross-sectional type of study, we have compared two groups sampled from our 1,000 families. One group had no deficiencies of these rudimentary facilities—they are the “well-housed” group. The other group had deficiencies in six or more of the factors considered—they are the “ill-housed” group. It should be pointed out, however, that the group with no deficiencies were only relatively well-housed. Many would be given a low score on an absolute index of housing quality.

At the time of the initial interview, the female head of the household was asked a series of attitude questions. The answers show that more of the well-housed than of the ill-housed liked the apartment “a lot,” found the neighborhood a good place to live, and liked their neighbors “a lot.” More of the ill-housed than of the well-housed reported that lack of space and poor appearance of the apartment hampered their entertaining of friends.

The well-housed were considerably more likely than the ill-housed to eat together “always”; to find it “very easy” to achieve desired privacy; and to consider that they were better off in life now than they were 5 years ago. The well-housed were also more likely to believe that they could better themselves through their own efforts; to be optimistic and think things were going well; and to be less nervous

and less moody. These findings would appear to suggest confirmation for the hypothesis that good housing leads to greater satisfactions and a generally better outlook on life.

Are these differences due to differences in housing quality and to nothing else? Unfortunately, in the cross-sectional study we cannot be sure. Both groups appear to be similar in a number of characteristics. Both groups have shown similar social “know-how” in applying for public housing. They are both homogeneous in ethnic background and stock. The total family income range is very similar, the median for both groups being in the \$2,000–\$2,500 bracket; 70 percent in both groups have lived in the city for 15 years or longer; education is similar, the median level attained in both groups being junior high school.

But note these differences: The ill-housed are more likely than the well-housed to be on welfare; to keep house rather than work; to be younger; and to have more children. Seventy percent of the ill-housed have three or more children compared with 30 percent among the well-housed. Although the two groups have similar distributions of total family income, the fact that the median number of children is higher in the ill-housed group means that the effective income per person in that group is lower; thus the same money must be stretched to cover more persons.

So perhaps factors other than housing might account for the differences we have observed in attitude and psychological state. In any event, there is probably interaction between housing and other factors, and we cannot be sure about the influence of housing *per se*.

For many theoretical and socially practical purposes, it is enough to know that all these factors seem to be playing some role, perhaps in concert. The many cross-sectional studies made during the past 30 years have described relationships between indicators of social class and many kinds of physical, behavioral, and social pathologies. But they are sometimes difficult to interpret. Cloudiness of interpretation is sometimes overcome by careful and painstaking secondary analysis, using the techniques of partial correlation. Such techniques are often of little value, however, inasmuch as

the elements of social class are generally highly correlated with one another.

The Longitudinal Study

A controlled longitudinal study holds the promise of answering many of the vexing problems of interpretation that beset the single-point-in-time study. For example, if two groups who are to undergo differential housing experience are very similar at the beginning of the study and if the character of the housing they occupy is the only difference between them during the period of the study, then any differences between them at the conclusion of the study can logically be attributed to housing. Furthermore, a sounder base for more refined analysis is possible. Thus, we may suspect that families at different income levels are not equally affected by differences in housing. It may be that when we contrast the well-housed and the ill-housed among families of low income, the effect of housing is quite large. The effects of housing at higher income levels may be negligible. In any event, in the controlled longitudinal study, we have the possibility of pulling housing out of the circular chain that confounds interpretation of single-point-in-time studies. On logical grounds, when one is interested in the precise effects of a single variable, the controlled long-term study is superior to the single-point-in-time study.

The difficulties of the longitudinal study begin when one attempts to insure the basic assumptions of such a study; for example, the assumption of initial comparability of the two groups under examination. Another difficulty arises from the problem of attrition from both test and control groups. A third difficulty arises from staff and field practices that are intrinsic to long-time studies, such as maintaining uniformity of interviewing procedures over a period of time and at any one time of insuring identity of procedure with both test and control groups.

Comparability of Test and Control Families

In matching as closely as possible the test and control families for our study we found that selection of particular families for the test

group was influenced to some extent by the families available for the control group. For example, we tended to avoid choosing as test families those with certain characteristics of age and number of children because that category of families was in short supply in the control pool. Similarly, we tended to avoid an excess number of small-sized families because the probabilities were higher that these families would be rehoused during the course of the study and thus drop out of the control group.

After the first matching of test and control families and the initial interview, we reviewed the goodness of matching and were able to revise the control group to improve matching. We are now satisfied that we began our study with two well-matched groups of families.

But here is the price we paid. Our groups contain no white families and relatively few Negro veteran families. Thus, we probably have a somewhat unrepresentative sample of typical housing applicants. We were willing to pay this price, since the range of family types and of personal characteristics of individuals remaining in our groups is still sufficient to permit the drawing of comprehensive generalizations from our findings.

Almost all sample surveys suffer losses from the initially defined samples because of refusal to cooperate in the study, "nonlocates," and respondents not at home. For single-visit studies the usual loss is from 6 to 10 percent. In analyzing the data, the usual procedure is, regrettably, to ignore losses, on the assumption that they divide themselves on all issues as do the bulk of the sample remaining in the study. Sometimes this procedure damages the interpretation considerably.

In a controlled longitudinal study, permanent losses may cripple a study before its announced termination date. We visit each family every 10 weeks during the "after" period of the study. If the usual 6 to 10 percent loss occurred during each series of home visits, three afterwaves of interviewing might result in an 18 to 30 percent loss. Permanent losses of this magnitude could make sound conclusions from the study almost impossible to draw, especially if there is reason to believe that the attrition is biased in some way.

We find that the intactness of a sample over time is a direct function of the efforts made to obtain the interviews. As a result of considerable expenditure of effort, we have kept losses to little more than 1 percent per wave of interviewing.

Our study, however, suffers from another kind of loss. Since our control families are applicants for public housing, some are eventually awarded apartments in one or another of the city's housing projects. This improvement in housing for some of our control families can only mean a lessening of the difference in housing quality between the initially constituted test and control groups, and may make it harder for us to detect dependent variable differences. We are, however, reluctant to drop these families altogether since there may be some bias in who makes the move, so we are continuing to interview these control families even though they no longer live in the slums. We also plan to use this group for a special analysis, since we will have several "before" measures prior to the improvement in housing.

Staff and Field Procedures

That interviewers will vary in performance is an established fact in survey interviewing. Such variations may affect the nature and quality of responses. In many single-visit surveys this problem is neglected and such neglect may distort the findings.

In a longitudinal study, we are faced with not only the ordinary between-interviewer variability but also with between-wave variability, and possibly, most dangerous of all, between-group variability. All three kinds of variability may have influence on the data and in general can only partly be corrected for at the time of analysis.


In our study we are using a series of procedures of assignment and quality control which appear to be useful in curbing these variabilities. For example, within a wave, we are assigning to each interviewer the twins of a matched pair of families. The between-wave and between-group variability is curbed through the efforts of a team of field supervisors whose business it is to keep track of interview quality. The supervisors observe each inter-

viewer in the conduct of actual interviews at least once each week during a wave; questionnaires are reviewed and errors and inconsistencies are pointed out to the interviewer; finally, a sample of each wave is postenumerated with a brief questionnaire to verify the facts reported in the original interview.

Single-visit and longitudinal surveys differ in other ways. For one thing, the financial outlay necessary to do a long-term study in a sound manner is, we estimate, 5 to 7 times that for a single-visit study which covers the same ground. Proper implementation of the study design in a longitudinal study requires enormous outlay in personnel and time.

Another difference between the two methods, and one which rarely receives attention, is the differential impact on the researchers themselves. In many single-visit studies, the basic findings are understood and the hypotheses are confirmed or not within a year from the onset of the field work. In our study, even after 2½ years of activity we are without major findings and with none in sight for perhaps another year.

Prognostic Indicators In Mental Illness

 With the advent of specific therapies in the field of mental disease, it has become essential to determine for each patient the particular therapy from which he is most likely to benefit. This is a different picture from earlier days

Based on a paper by Joseph Zubin, Ph.D., principal research scientist, Eugene I. Burdock, Ph.D., associate research scientist, Samuel Sutton, Ph.D., senior research scientist, and Frances Cheek, M.A., assistant research scientist, all members of the staff of biometrics research, New York State Department of Mental Hygiene. Dr. Zubin is also professor of psychology at Columbia University. This study was aided by Project M-586C under a grant from the National Institute of Mental Health, Public Health Service.

when the one universal method of treating all mental patients was custodial care.

Prognosis is the only method available at the present time which makes possible the identification of patients who do or do not get well under current therapies. Moreover, in developing experimental designs for the evaluation of a new therapy, it is important to know the prognosis of each patient under nonspecific therapy in order to establish control groups.

Prognosis is always difficult because it is prediction. In the field of mental illness prognosis faces special difficulties. The disease entities are poorly defined. Knowledge regarding the natural history of the illness is lacking. The potential of the therapist as a factor influencing outcome of the illness is variable. Objective criteria for gauging the mental patient's improvement do not exist. Valid followup data on discharged patients are lacking.

There are at least three types of prognostic indicators in mental illness: psychological test prognoses, psychiatric prognoses, and social work prognoses. All three are useful. But most prognoses have been impressionistic, and their overall accuracy has been low. It is essential that greater objectivity be introduced in the prognostic approach to mental disease.

Three Prognostic Indicators

An analysis has been made of 183 articles which reported studies on the relationship between psychological test performance and outcome of mental illness. Many of the studies failed to demonstrate empirical justification for the conclusions drawn, and there was little agreement in findings among the studies.

In future research on prognosis through psychological tests, variables must be controlled to a much greater extent than has been customary in the past, if reliable prognostic indicators are to be discovered. The patient population must be described in all pertinent detail, the conditions of therapy stipulated, and objective criteria of outcome presented. The experiment must deal with relatively homogeneous populations and conditions. Findings should be reported in terms amenable to statistical evaluation, and must be subjected to cross validation.

Until recently most of the tests used were of the conceptual type. There is a growing need for developing tests and techniques for sampling the entire range of human responsiveness: physiological, sensory, perceptual, psychomotor, and conceptual.

Data in the studies reported in some 800 articles which had bearing on the value of psychiatric prognoses have been analyzed trait by trait in an effort to determine the relevance of each trait to outcome of illness. Traits were classified under such headings as physical characteristics of patient, emotions, thought processes, course of disease, and so on. A majority of the studies failed to give sufficient data about the nature of the patient or the therapy, and so results of the analysis must be regarded as tentative. It seemed that for about 10 percent of the traits, specific therapy showed an advantage; for another 10 percent, a disadvantage; and that for about 80 percent, the direction of prognosis was unchanged from that expected under nonspecific therapy, regardless of the type of therapy employed.

Investigation is being made of the background information of some 200 patients, with all the prognostic traits included. From these data it may be possible to make pattern analyses of the constellations of prognostic indicators, which may be more helpful in evaluation of outcome than are single traits taken one at a time.

A pilot study of the relationship between home environment and outcome of illness of 51 schizophrenics, using data from the case records on social workers' preconvallescent evaluations of family environment and of convalescent adjustment, indicated that, in a 1-year followup, those with "good" homes showed poorer outcome in terms of "in" or "out" of the hospital than those with "poor" homes. However, when their case histories were analyzed and indexes of pathology based on a study of the literature on prognosis were constructed, those with "good" homes also tended to show more pathology than those with "poor" homes.

In a subsequent study of these 51 schizophrenics by a group of 6 social workers, a set of criteria for good, fair, and poor homes was developed. The criteria included emotional as well as physical factors in the home. The social

workers were also responsible for the systematic collection of data through interviews with patients and families. The criterion of outcome used was number of readmissions to Brooklyn State Hospital or other mental hospitals since 1953.

The findings of the study showed that outcome of illness both in good homes and in poor homes was worse than outcome in fair homes. As to pattern of rehospitalization, in the category of good homes there were shorter and more frequent hospitalizations; in that of fair homes, less frequent hospitalizations, whether long or short; and in that of poor homes, primarily short and very frequent hospitalizations. Degree of pathology was not taken into consideration in this study, but it was hypothesized that poor outcome in the poor homes might reflect the environmental factor.

A study of 230 schizophrenic patients is now in progress to test the interrelationships of degree of pathology, home environment, and convalescent adjustment. Degree of pathology will be defined by an index based on case history items. Home environment and also convalescent adjustment will be evaluated by social workers through structured interviews with the family and the patient.

Criteria and Measures

Objective criteria of outcome in mental illness are needed, and efforts are being made to develop them.

An index of stability of outcome is obtained by computing the percentage of time, within a specified followup period, which the discharged patient spent in the community before being readmitted to the hospital. He may return several times during the followup period, or he may not return at all, in which case the rating is 100 percent. This kind of index is regarded as a more basic measure of outcome than the much-used but undefinable terms "improved" and "in and out of hospital."

An immobility index, which may range from 1 to 24, is obtained by dividing number of months spent in the hospital within a 2-year period by number of moves into the hospital, counting first admission as first move. The 2-year period was chosen because several earlier

studies had demonstrated that most patients who remain in the hospital longer than 2 years have a constant and very low discharge rate.

The level of the patient's adjustment in his family and the community is another criterion of outcome. In a current study a social worker interviews the discharged patient and his family at specified intervals to obtain data on the quality and quantity of interaction by the patient with his roles in the family, at work, and in the community. A standard interview schedule is used. An attempt will be made to assign weights to items in order to construct an index of convalescent adjustment.

The patient's adjustment while in the hospital is also being studied. Behavior scales have been developed for use by ward attendants, the items so worded as to minimize confusion about meaning and so interspersed as to minimize the halo effect. An attempt will be made to see how much information each item conveys and to construct an index of hospital adjustment.

A very important problem facing the biometrician is that of integrating the variety of measures obtained from all sources. New methods to do this must be found, employing techniques suitable for the analysis of the individual as well as of the group. Two techniques—the agreement score and the distance score—are being utilized.

Epidemiology

Until recently epidemiologists of mental illness have been concerned chiefly with etiology. Epidemiological factors, such as parnatal influences, familial incidence, national origins, early development, parental attitudes, employment, neighborhood environment, have been examined for their etiological import, but their significance for outcome has not been emphasized. Yet all such epidemiological factors loom large in the welfare of the patient. They are an important tool in rehabilitation. They are of consequence in relieving or preventing stresses that may aggravate the improved patient. Even if treatment is only on an ameliorative level, epidemiological factors become the chief source of maintenance of the patient in the community.

The achievements of epidemiology in warding off the effect of epidemic physical disease have been notable. Great need exists to have the epidemiological approach extended to the field of mental illness to discover what good it can achieve.

Seasonal Variations In Admission of Aged

brief The increasing number of the aged admitted to mental hospitals is shown by Benjamin Malzberg, Herbert Goldhamer, and Andrew Marshall and others as a rising trend, believed to be the result of increasing rates of admission as well as increasing numbers of aged persons. To what extent do such increases reflect demands for hospitalization rather than a real rise in the incidence of psychoses of the aged? This is a matter for further investigation.

Mental hospital admissions of the aged are being studied by the New York State Mental Health Research Unit in Syracuse. Systematic patterns of hospital admissions within Syracuse, as well as systematic differences in the rates of admission from different communities, have been observed and reported. More recent findings relating to seasonal distributions of mental hospital admissions of persons 65 or more years old in upstate New York during the 7-year period 1944 through 1950 are reported here.

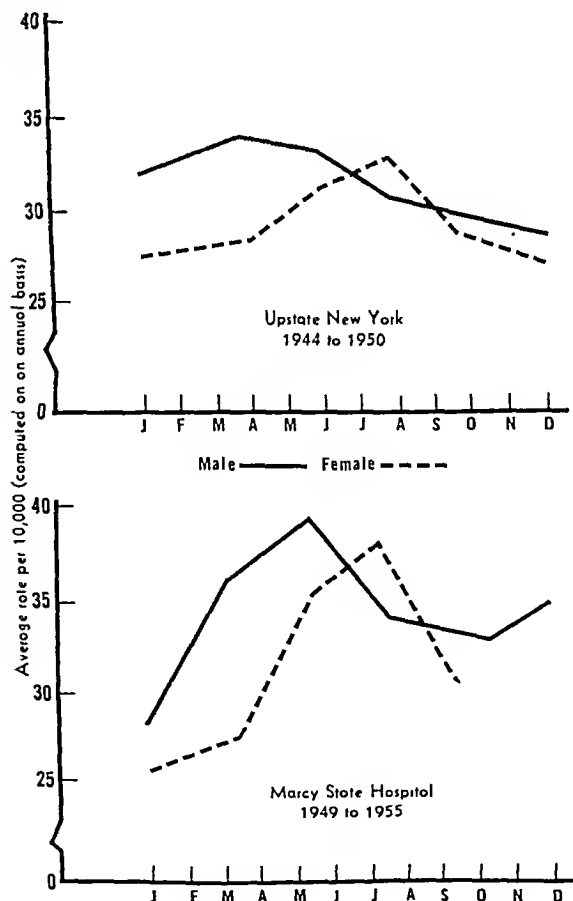
Upstate New York includes the entire State except New York City. For State and licensed mental hospitals during the 7 years, the total number of admissions of persons 65 or more years old with diagnoses of cerebral arteriosclerotic and senile psychoses was 13,800. Of this number, 6,550 were men and 7,250 were

Based on a paper by Isabel McCaffrey, M.S., associate biostatistician, Joseph Downing, M.D., acting director, and Eugene Rogot, A.B., senior biostatistician, all of the mental health research unit, New York State Department of Mental Hygiene.

women. The seasonal pattern of rates of admission, computed on an average annual basis for 2-month periods beginning with January–February and ending with November–December, was markedly different for men and women (fig. 1). There was a single peak (32.5 per 10,000 of the population) for women in the July–August period, whereas the rates for men appeared higher in the first 3 than in the last 3 study periods of 2 months each. Although rates for single years are not shown, we believe that there was a high degree of consistency in these patterns from year to year.

This unexpected finding led to study of the records of admissions of persons 65 or more years old to the Marcy State Hospital in 1949 through 1955. The hospital district had an

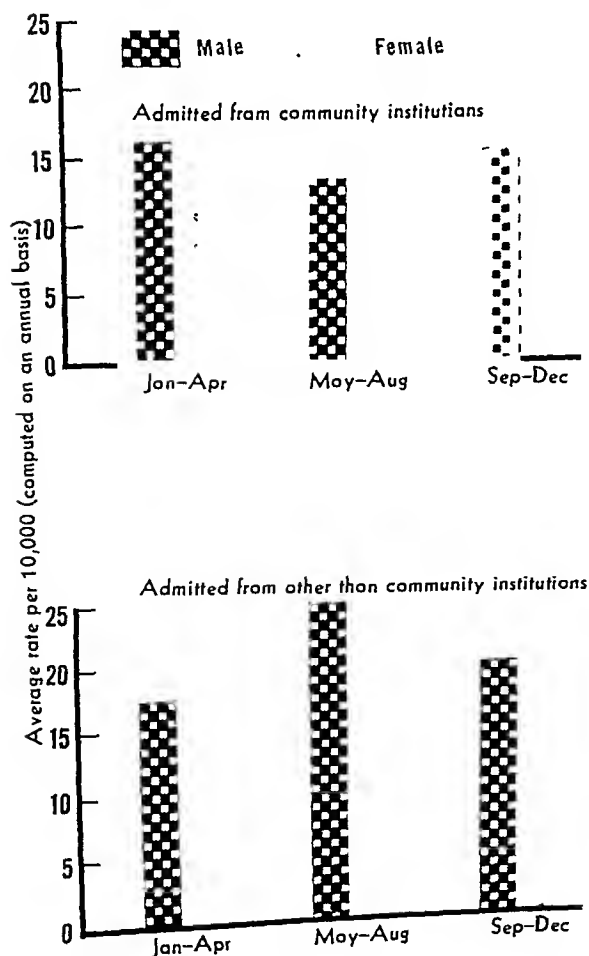
Figure 1. Rates of first admissions for psychoses of the aged, by month of admission, upstate New York mental hospitals, 1944–50, and Marcy State Hospital, 1949–55.



estimated total population approaching 600,000 in 1950. Approximately 60,000 were 65 or more years old. Half of the district population lived in Onondaga County, which includes Syracuse. Five other cities in the district had populations of 10,000 or more in 1950; the largest, Rome, had a population of 42,000.

The number of admissions in the Marcy State Hospital study was 1,354. The seasonal patterns in the rates of first admissions of patients with old age psychoses from this district (lower part of fig. 1) are thought to resemble those of the upstate area for both men and women, although the differences between the high and low points in the Marcy district were approximately twice those of the upstate New York area as a whole.

Figure 2. Rates of first admissions to Marcy State Hospital for psychoses of the aged, by month, according to source, 1949-55.



Of the 1,354 admissions, 15 percent had been patients in general hospitals at the time of admission. Another 26 percent had transferred from other local institutions such as nursing homes, homes for the aged, and county homes. Hospitals and other institutions contributed 41 percent.

Other studies have shown that significant numbers of mentally ill patients may be found in such local institutions. It is apparent from the Marcy State Hospital data, however, that a significant number of mentally ill patients in this age group are transferred also to mental hospitals. The proportion of patients in local institutions who undergo such transfer is unknown, but the proportion of such transferred patients among State mental hospital admissions is large. Such transfers may be a factor in the seasonal variation of admissions.

As shown in figure 2, the admission rates for men were higher than those for women in the group admitted from community institutions. No excess in male over female rates was found, however, for those admitted from other sources. Likewise, the difference in the seasonal pattern of admissions for male and female patients appeared only among those admitted from community institutions.

The difference in the total male and female rates of admission from community institutions could have come about as a result of relatively large male populations in institutions such as county homes, or it may have resulted from the selection by such institutions of men rather than women for transfer to State mental hospitals. Other selective factors in mental hospital admission may be suggested by the difference in the male and female seasonal distributions of admissions from local institutions.

A group of 139 patients admitted from private residences died within one month following admission to the Marcy State Hospital. This group, however, is believed to be too small to have much bearing on small seasonal differences. The symptoms and behavior characteristics of the admissions were classified into eight groups.

Disorientated and confused, including statements such as "deteriorated," "forgets," "does not recognize family," "irrational," "rambling," "understands nothing."

Unmanageable and disturbing to others, including such statements as "irritable," "needs restraints in bed," "noisy," "screams," "refuses care," "runs away," "wanders," "uncooperative."

Excited, including such statements as "agitated," "sleepless," "restless," "overactive."

Hallucinations or delusions, or both, including statements such as "imagines things," "talks to dead persons."

Depressed, including "apathy," "despondent," "does not eat," "retarded," "wants to die."

Destructive, including "abusive," "assaultive," "beligerent," "breaks things," "strikes other people," "violent," "throws things."

Paranoid, including "argumentative," "believes everybody against him," "suspicious attitudes."

Suicidal, including suicidal threats.

Except for suicide, the symptoms above appeared in more than a third of the patients admitted in the early summer. Destructive behavior appeared in 47.8 percent and depression in 36.4 percent. The differences between the observed and expected distributions (33.3 percent in each 4-month period) were significant at the .001 level for those who were either confused or disoriented, or both, and those who were destructive, unmanageable, or excited. The distribution of admissions with recorded hallucinatory symptoms was significantly different from the expected distribution at the .01 level.

These findings are based on the 658 patients

admitted from private residences and surviving more than 1 month following admission. The effects of possible selective factors associated with transfers from local institutions and terminal physical conditions are believed to have been minimized. Whether summer-time increases in admissions of the psychoses of the aged and groups of symptoms and other characteristics considered separately suggest actual increases in either the prevalence and severity of the disease, or both, at that season cannot be determined from these data. Summer increases in rates of hospitalization might also be due to changes in transportation, or to seasonal changes in problems of home care and supervision.

Of the many plausible hypotheses that might be suggested, however, some are of epidemiological significance. These are concerned with the natural course of the disease process and its manifestations. Others are of community interest in that they are related to variations in needs for facilities for the care of the aged.

Little is known about the circumstances that determine when the family of a patient will seek care in a mental hospital rather than a local facility or undertake to provide necessary care and supervision in the home.

Study of Fine Particle Techniques

A course on fine particle techniques will be conducted at the Robert A. Taft Sanitary Engineering Center, Public Health Service, August 5-9, 1957. Enrollment is by application; there is no tuition fee.

The course is designed for professional personnel concerned with investigation of particulate matter in atmosphere. Some of its major topics are: physical and chemical properties of small particles, sampling equipment, particulate quantification, size measurement, fine particle statistics, radioactive particulates, and biological particulates.

Address requests for further information to Paul Woolrich, chief, Air Pollution Training, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio.



Interstate Cooperation in Mental Health

SIDNEY SPECTOR

ONLY a decade ago journalists, commentators, and other analysts were searing our newspapers with blazing portraits of inhuman conditions in the Nation's mental hospitals.

They indicated with passionate intensity the brutality and neglect, the barbaric use of physical restraints and seclusion, the unbelievable decay and deterioration of buildings, the terrible portent of jamming almost a half million people into hopelessly overcrowded facilities.

They portrayed bedlam and despair. They wrote that physicians were so encompassed with the burden of patients that little or no time could be given to active treatment. Lack of adequate therapeutic equipment intensified the tragedy. Lack of adequate funds meant low salaries, poor housing, exhausting working hours, and harassed administrators who could give little encouragement to research and to the establishment of a scientific environment. The relatively low recovery rate of mental patients induced defeatism and led to custody instead of treatment and cure.

Albert Deutsch summed it all up "as the tragic evidence of accumulated decades of neglect, public apathy, legislative penury, and administrative despair." But in October 1954, when Deutsch addressed the annual meeting of the National Association for Mental Health, he pointed to dramatic advances in recent years

in State after State. He was aware of the sobering fact that too many mental hospitals still were being operated on a custodial and not on a therapeutic basis. But, after surveying the progress of the last decade, he felt no hesitation in predicting that "barring man-made cataclysms the next decade will see more advances in the war against mental disease than were registered in any previous century."

In this development, political leadership in the States has played, and will continue to play, a key role. With more than 85 percent of all mental patients in State mental hospitals, perceptive candidates for public office are sensitive to the most rapidly rising form of expenditure by State government. At this point they are alert to the proposition that a heavy investment in preventive techniques, personnel, training, research, intensive treatment, and rehabilitation, not custody, is the only effective alternative to continuing costly construction of hospitals for mental patients.

In addition, during and after World War II, mental illness gained recognition as a feature of the general social climate, and plans for its treatment emerged as a natural political phenomenon. I am reminded of a legislative district in which two competing candidates for a State election vied fiercely with one another in their promises of solving the problems of emotionally disturbed children. "Emotionally disturbed children" sounds so eloquent, so mellifluous and pear-shaped, and produces such favorable visceral reactions that I predict an

Mr. Spector, director of the Interstate Clearing House on Mental Health, Council of State Governments, was formerly director of research of the council.

intensive, perhaps excessive, concern for this one element of mental health.

The essence of progress in many fields at the level of concrete action in a democracy is the assumption of service responsibilities by political parties competing for electoral advantage. Out of this political ferment, which Deutsch, in his fine phrase, has labeled "a stirring in the States against mental disease," has emerged a glowing, intense concern for human welfare. The postwar convergence of political campaigns, costs, climate, and conscience led to a genuine humanitarian drive to treat the mentally ill and return them to productive lives as quickly as possible, to identify and treat mental illness early, to prevent unnecessary hospitalization, to educate for and promote mental health.

As a result, public leadership in State legislatures and executive departments is devoting more thought, time, and energy to mental health and related issues than at any time in our recent history. In many ways mental health services have become crucial tests of the survival of State government in a Federal system.

The long-term trend whereby the centers of important economic and political decisions move farther and farther away from the individual within his local government and toward higher levels will not be arrested by emotional slogans. They are rather directly related to the degree to which State governments assume their responsibilities and fulfill their obligations as responsive government units. As the Kestnbaum Commission on Intergovernmental Relations stressed in a basic document (1), the sinews of the Federal system can only be reinforced when State and local governments effectively and efficiently provide the services the people demand and raise on their own the financial resources to pay for these services.

A Decade of Progress

What then are some of the accomplishments of the last decade which, because of urgent, immediate unfulfilled needs, go too often unobserved?

Measured in dollars and cents, the States in 1954 spent for mental health care approximately

3 times the amount spent in 1945, and the sums for salaries and wages quadrupled. Within individual States the increases for salaries and wages were even more spectacular: Arkansas, almost 400 percent; Connecticut, about 400 percent; Delaware, 550 percent; Kansas, 650 percent; and North Carolina, 450 percent.

Figures for daily per patient costs for maintenance and operation of hospitals underline the same story. The average for the United States increased from \$1.06 in 1945 to \$2.84 in 1954. Here, again, within numerous individual States the increases were likewise spectacular: Connecticut, 230 percent; Delaware, 235 percent; Kansas, 450 percent; Nebraska, 275 percent; New York, 131 percent.

Of course, much of the rise resulted from an increase of some 50 percent in the general price level. But the average for the Nation came to 168 percent, or more than 3 times the price level increase.

Actually, however, the relative burden on the taxpayer did not change that much during the period since national income per capita also rose 105 percent from 1945 to 1953. The average person had more than doubled his income and was in a position to support public services.

Measured in personnel, the number of physicians in State mental hospitals almost doubled; psychologists increased 574 percent; social workers, 165 percent; graduate nurses, 107 percent; attendants, 112 percent. General staff-patient ratios, despite a 17 percent rise in resident population and a 39 percent increase in first admissions, also climbed 76 percent.

With respect to organization and administration, mental health departments have been reorganized and revitalized in many States for a more effective, coordinated approach toward preventing mental illness and promoting mental health. Twelve States now have formal departments of mental health or hygiene: California, Connecticut, Kentucky, Massachusetts, Michigan, Montana, New Hampshire, New York, Ohio, South Carolina, Tennessee, and Virginia.

About half the 48 States have consolidated mental hospital and mental health services within one department, either a department of mental health or welfare or institutions. A distinct trend in the last decade is the centering

of administration of all State hospitals in one department under a single commissioner appointed by the governor. Also discernible is a pattern of integration of community services with the mental hospital agency, whether the agency be a department of mental health, welfare, institutions, or, as in two instances (Idaho and Indiana), a department of public health.

Even more important, however, is the mature recognition that many agencies of government at all levels—health, welfare, corrections, education—are heavily engaged in mental health services, and that cooperation and coordination are far more urgent than simple structural centralization.

Measured in discharges of patients to active community life, progress is significant. In some hospitals at least 80 percent of first admissions are discharged within a year, and a return of 60 percent to the community is becoming common. As a matter of fact, my impression from traveling in the various States is that hospital populations are leveling off or lessening. State after State is issuing reports and statistics indicating surprise and delight at the trend. What the reasons may be, whether the trend is meaningful or not is still too early to determine.

With respect to the legal framework of mental illness, States are adopting modern codes in line with the concept that a mental patient is a medical problem, not merely a subject for legal action pointing to institutional isolation. In this connection, particular tribute should be paid to New York State's Joint Legislative Commission on Interstate Cooperation, which initiated the development last year of the Interstate Compact on Mental Health, and which joined Connecticut this year in adopting the compact.

Interstate Compact on Mental Health

I believe that the Interstate Compact on Mental Health, formulated and approved by the Northeast State Governments Conference on Mental Health, is a milestone in the history of improving the conditions of the mentally ill. Wide adoption of the compact by all States would put an end to the arbitrary shipment of mental patients around the country.

For the first time, it is recognized and as-

serted on an interstate basis that a person's eligibility for hospitalization does not primarily depend on length of residence in a particular State or on archaic, complicated legal definitions. It is mainly a function of a patient's medical disability. Under the compact a person needing hospitalization for mental illness or mental deficiency is eligible regardless of residence requirements. Where the patient will be ultimately hospitalized or transferred will also be a question for medical determination in his best interest. The compact also provides for supervision of a patient on convalescent status who may have to be sent to another State in order to be with relatives or close friends.

There has been real progress in the States, and a new hope for the mentally ill is born. But this is no time merely to consolidate gains. I have been concerned about the feeling among some States, which in recent years have invested large sums in attacking mental disease, that it is time to consolidate financially and stabilize. Other functions press forward and compete for limited resources. The cycle of interest may have hit its peak in some instances.

Despite the foregoing catalog of continuing progress, all of us are only too painfully aware that we have hardly reached the crawling stage in the field of mental health. To begin to cite the figures on personnel needs alone is to make the situation look hopeless. To set down realistic estimates of building requirements produces figures of prohibitive, well-nigh fantastic proportions.

Faced with problems of such magnitude, the States are joining forces in attempting a common solution through regional cooperation. Regional cooperation permits each participating State to obtain maximum benefit from the total resources of an area rather than rely upon facilities within its own limited geographic boundaries.

If resources would permit, each State individually might choose to provide centers for the training of all persons in each of the mental health specialties. However, it is sheer folly for every university and for every State to build and maintain its own medical school with training in every specialty or its own school of public health, of nursing, of social work, or of psychology. Rising costs—and the coming

rise of student enrollments—and especially the scarcity of magnetic teaching staff suggest that the goal of complete self-sufficiency in higher education is a delusion.

"Few institutions and few States," declared Harold Enarson, director of the Western Interstate Commission for Higher Education, "can do first-class teaching and research in all fields of knowledge. The only sensible approach is for each State and each school to do what it can do best, and beyond that, to pool resources."

It is preferable by far that a group of States support one teaching or clinical training center which can achieve accreditation and prestige than that each individual State maintain an isolated unaccredited center lacking the financial resources for adequate training.

Southern Regional Education Board

The most advanced example of interstate cooperation in mental health is the Southern Regional Education Board's pooling of the mental health resources of the southern States. The board was created in 1948 by the Southern Governors' Conference through an interstate compact of 14 southern States. Action by West Virginia and Delaware in 1955 brought the total membership of the board to 16 States: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

The Southern Regional Education Board is authorized to enter into agreements with States, educational institutions, and other agencies in providing adequate services and facilities in graduate professional and technical education. Under its aegis a student does not pay out-of-state fees when he goes out of State to school. The sending State pays an additional fee to the receiving school.

For example, Mississippi since 1949 has purchased places for 269 students in regional schools of medicine, veterinary medicine, and dentistry. Mississippi contributed almost \$1 million to professional education outside the State, but it would have cost the State at least \$8 million to build and operate the necessary schools during the period from 1949 to 1956. Thus the State estimates a saving of \$7 million

in these professional fields alone through the regional compact.

Interstate cooperation in the south has obtained needed services for the States without duplication and at minimum cost. The facilities of a \$2- or \$3-million school are provided for professional students at a cost of a few thousand dollars annually. Qualified students are assured of schooling without having to pay out-of-state fees. Participating universities have broader financial support to provide stronger faculty and better facilities.

The program has made sense to governors and legislators. The whole concept has been not to erect new regional schools but to strengthen and improve existing institutions, building upon them and making better use of them.

Southern regional cooperation in professional education was expanded by the Southern Governors' Conference in 1953 to include training and research in the field of mental health. With a grant of \$50,000 from the National Institute of Mental Health of the Public Health Service, the Southern Regional Education Board formed the Commission on Mental Health Training and Research, headed by the Governor of Tennessee and composed of public health and university officials, legislators, administrators, and representatives of the various mental health professions.

In addition, the governors each appointed State committees, with similar composition, in order to bring new and powerful proponents into the movement and to undertake surveys of resources and needs in each State. A great regional conference, held in 1954, afforded persons from all areas an exceptional opportunity to organize for concerted action. The organizing conference was followed by a legislative work conference in Houston the same year. A report was made to the Southern Governors' Conference in November (2).

The governors authorized the creation of the Southern Regional Council on Mental Health Training and Research, to be supported by annual contributions of \$8,000 from each State.

Mental illness is not a problem to be solved; rather there are continuing tasks to be undertaken.

The council will serve to expand and improve mental health programs in the south and will

be an agency for consultation, stimulation, and problem solving that no individual State could undertake alone. If the south is successful, it will have gone a long way toward meeting a most pressing obligation.

Western and Midwestern Developments

A similar major effort is being made in the far west. At a meeting of governors' representatives in San Francisco, called March 25, 1955, by the Council of State Governments, a resolution was adopted to the effect that the Western Interstate Commission for Higher Education undertake an appraisal in the west of preventive efforts and training and research resources in mental health.

Again, as in the south, official committees were appointed by each governor to assist in this regional effort. A total of 262 persons serve on these State survey committees. The composition of the Colorado committee is typical of the western and southern groups. A State senator who is a former governor and lieutenant governor is the chairman. The other members are legislators, psychiatrists, psychologists, social workers, and university heads.

The National Institute of Mental Health again granted funds to finance a mental health survey. More than 26,000 people in the west were questioned as to where they stand on prevention and treatment. Here is an effort to pool the entire knowledge of a region in order to produce bold, imaginative ideas for full utilization of all skills in preventing mental illness and promoting mental health.

A successful regional conference was held in June 1956 to analyze the regional data and the State reports and to prepare recommendations for State and interstate action, with especial reference to the supply of trained personnel. One recommendation of the conference proposed that the Western Interstate Commission establish a regional council on training and research in the mental health fields in order to encourage cooperative interstate programs in this area. The findings and recommendations were presented to the Western Regional Meeting of the Council of State Governments in September 1956. The conference approved the

report and called for immediate steps to establish the Western Council on Mental Health. The National Institute of Mental Health granted \$171,000 for a 3-year period for this purpose. All this should result in more effective research, better training programs, an increase of well-qualified personnel, and an ever-growing concern of the public with problems of mental health.

A similar survey was also undertaken in the midwest in 1954, climaxed by the Midwest Governors' Conference on Mental Health in Chicago. It duplicated on a regional basis the National Governors' Conference on Mental Health held at Detroit in 1954, and adopted a series of resolutions for implementing the 10-point program of the national conference (3). One proposal suggested that an additional 10 percent of total State funds for mental health ought to be appropriated for training and research. This became a real, and practically realizable, objective for the midwest.

Northeastern States' Interest

In the northeast a somewhat different, but equally significant, interstate pattern has developed. For many years an exceptionally valuable conference of State mental health authorities has met annually in this region under the leadership of the Public Health Service. At its meeting in Hartford, Conn., in 1954, the conference decided to expand its purpose and membership in line with the recommendation for regional conferences included in the 10-point program adopted at the National Governors' Conference on Mental Health (3). The group altered its name to the Northeast State Governments Conference on Mental Health and requested the Council of State Governments to co-sponsor its meetings and to expand participation by inviting budget officers, legislators, representatives of governors, and other State administrators.

The conference is held twice a year. The spring meeting is composed primarily of professional workers in mental hospitals and community service programs. The fall meeting spreads participation to legislators and executive officials. An extremely interesting meeting in Asbury Park, N. J., in March 1956 dis-

cussed inpatient services for children, problems of mental retardation, and the training of leaders for community mental health programs. The areas of consensus and of difference freely arrived at in this conference were examined in the fall by representatives of politics, government, and the general public for possible concrete action on an interstate or intrastate basis.

Listing the Achievements

Each of these regional developments has been particularly effective in bringing about an unprecedented community of interest on a regional basis, a community of interest not only within and among professions—a feat in itself—but among governors, legislators, laymen, and others. The area of participation and decision making in a previously somewhat closed family unit has widened into the harmonious working together of professional people and laymen.

A second achievement is the discovery that no State can go it alone, that one of our greatest resources is the concept of regional planning to which definition has been given by the interstate compact device. Here is a major new form of permissive governmental organization ready for further development.

A third result was the happy environment which brought forth a problem-centered, rather than a profession-centered, approach. Conspicuous among these regional movements is a concern for problems, rather than prerogatives. This, in the field of mental health or elsewhere, is no mean accomplishment.

Fourth, the regional plans are having a great impact on individual State programs. No factor is more influential in the improvement of State government than that of comparison and emulation. The voice of a whole region has stamped the needs of the mentally ill upon the conscience of the public, professional, and political leadership in each State.

Finally, these regional movements, the discussions at each of the last 6 or 7 governors' conferences, the information supplied by such organizations as the National Association for Mental Health, the National Institute of Mental Health, the American Psychiatric Association, the American Medical Association, the Council

of State Governments, and the numerous other agencies in this field have paid off in legislative action.

Throughout the Nation, 1955 was a record year as far as financial investment in mental health is concerned. One survey showed that 38 out of 42 States had increased appropriations, thus attracting more personnel to State mental hospitals (2).

Several States provided funds for community services for the first time, and many expanded their funds beyond any previous appropriations. Still, the amounts are negligible, except in New York State which has approached the problem in a somewhat realistic manner.

But the most conclusive measure from our point of view is the funds made available for training and research. In these twin focal points of national and regional action in 1954 and 1955, accomplishments are evident. States that had never dreamed of investing in training and research did so—and spectacularly. Of the 12 State legislatures meeting in the south in 1955, 8 gave special attention to training and research. Nine out of ten State legislatures in the midwest, 4 out of 10 in the northeast, and 1 out of 11 in the far west, where the movement really has just begun, likewise emphasized training and research. Funds available in 1956 for training and research were about 2 to 2½ times the amount made available in 1953.

Actually, I have felt that we may be embarrassed today not so much by the lack of funds for research as by the inability to spend productively what we already have. Our major problem is one of competition for the brilliant researchers and the magnetic teachers who will know how to use existing funds wisely.

This dramatic pattern of regional cooperation in every section of the country touches all 48 States. Still a crawling movement, its progress has probably been overstated. This development is not a one-shot affair. Continuing mechanisms are being formulated to keep the momentum going and accreting. In this way, it is hoped that the States can join actively and boldly in solving their problems in the field of mental health. Mental health programs devised, financed, controlled, and operated by the

States constitute a positive demonstration of meeting responsibilities and of executing rights.

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Back to Work Movement

To help restore mental patients to homes, jobs, and family life, mental hospitals should be small, open, and close to the hometown. Clinical facilities should also be extended to facilitate the care of patients in their hometowns and social services strengthened for the mentally ill.

When a family has to travel 600 miles to visit a patient, as some do, they tend to lose touch. As for locks and other restraints, Dr. T. P. Rees, director of an outstanding open hospital at Warlingham Park, England, has found that unruly behavior of mental patients is often the result not so much of the disease as of the conditions under which patients are detained. Such hospital practices stigmatize the patient and place gratuitous blocks in the way of recovery and rehabilitation. Thomas A. C. Rennie and others have given practical demonstrations of rehabilitation, and M. J. Rockmore and R. J. Feldman have found that discharged mental patients are less likely than members of the general population to commit serious offenses. Confusion of the legal process of commitment with legal competence is another obstacle to recovery of the patient.

—GEORGE S. STEVENSON, M.D., *consultant for the National Association for Mental Health, addressing the 1957 National Health Forum.*



The Rising Tide of Mental Health

FILLMORE H. SANFORD, Ph.D.

THE WHOLE mental health enterprise as I have seen it in the last year or so seems susceptible to certain general observations. I submit them with some misgiving, for I was reared on down-to-earth correlation coefficients and chi squares. While the following declarative sentences begin earthily, their predicates are in the clouds. I pass along these observations, 18 of them, with no final confidence in them, hoping only that if they are not right at least they may be provocative.

1. There may be both intellectual tickle and some utility in conceiving of mental health as a social movement, a social movement as vast in scope and consequence, perhaps, as the Renaissance or the Industrial Revolution. We can, without being more than mildly insane, regard ourselves as having just passed through the era of the economic man and as being on the threshold of the century of the psychological and sociological man.

2. Evidence for the existence of a significant and encompassing mental health movement includes such factors as the following:

The obviously increased public and governmental concern for the mentally ill.

The widespread use in all media of communi-

cation of psychiatric and psychological concepts in dealing with human affairs.

The frequency of use of psychiatric and psychological concepts by ministers, lawyers, teachers, and other highly visible and influential people.

The popularity of courses in college and recently in high schools in psychology and mental hygiene.

3. This social movement flourishes in America because of such factors as (a) the high standard of living, (b) the relative freedom from the ravages of disease, (c) a relative freedom from, or nakedness of, tradition, (d) the speed and volume of communication, (e) the promulgation and acceptance of a naturalistic, cause-and-effect view of human behavior—a view which, right or wrong, places a great faith in natural man's ability to take thought, to apply knowledge, and thereby to cure his own ills and to advance his own welfare. There is a concomitant fading of the belief that natural man must either debase himself or put up with slings and arrows in order to meet his fate.

4. This kind of movement seems to be uniquely American. Perhaps, in some respects it is a luxury movement flourishing, especially in its positive aspects, only where life is not dominated by physical urgency and grimness.

5. The mental health movement seems to have two distinct but interacting branches. Or at least it may be profitable to conceive it this way and see what happens.

One branch of the movement has grown up

Dr. Sanford, associate director for scientific studies, Joint Commission on Mental Illness and Health, presented these observations at the 1957 National Health Forum, held March 20-22 at Cincinnati, Ohio. Sponsoring the forum's program on better mental health were the 59 national organizations making up the National Health Council.

within the medical frame of reference. It is rooted in the cardinal values of preserving life and reducing morbidity. Its goal, universally ascribed to, is the humane and effective treatment of the mentally disturbed. Its form and flavor derive from the humane traditions of the medical profession.

6. Another and conceptually separable segment of the mental health movement has its roots in the western humanistic and democratic ethic. Its goals concern the growth and development of the human individual. Its beliefs have it that through the application of scientific knowledge about human beings and their social environments it is possible to help the individual live more fully, more maturely, more creatively. Some mental health enthusiasts seem to emphasize the values of adjustment, efficiency, and conformity. Others, perhaps less culture-bound, emphasize the human attainment of freedom, of individuality, of spontaneity, of creativity. But there is a general focus on the individual—the normal, striving, growing, learning human individual.

7. Within the medically oriented segment of the movement, there has been vast change in the last hundred years. The mentally disturbed person is no longer possessed by a devil nor is he a criminal. Increasing knowledge and increasing public humaneness has defined the mentally disturbed as a sick person, fully deserving the care given the ill. The asylum has become the mental hospital. Recent progress has been in the direction of a more precise definition of mental illness. The mental case is no longer merely a member of the class "sick person" but is recognized as a member of a unique class of sick persons, needing unique treatment. Some authorities now go so far as to recommend that the mentally ill person should not be treated at all in the hospital setting, that defining him as a hospital case does not recognize his uniqueness, does not find for him the most effective psychosocial treatment.

8. The development of psychiatric care for the mentally disturbed has had a profound influence on all medical practice. The knowledge of the relation between somatic symptoms and emotional processes, the increasing knowledge of psychosomatic phenomena, has revised the

purely biological orientation of medicine. Now, even surgical patients are regarded as people, and both the physicians and the nurse are under pressure to learn some psychiatry, psychology, and sociology.

9. The medical segment of the mental health movement has been characterized by a fairly exclusive focus on intrapsychic processes. This seems to me to characterize the corps of theory and practice in the professions.

Troubles have been diagnosed and treated within the skin of the single individual. There is some change. There have been Sullivan and Meyer and social psychiatry and counseling psychology. The sociologist and anthropologist are now colleagues of the psychiatrist. But in training programs for mental health personnel, the standard curriculum still focuses on the past and present intrapsychic processes of the individual. Social workers, for example, who used to look for evil in society now tend to look for it, like the rest of us, within the single individual.

10. The medical segment of the mental health movement has focused on the clinical approach. Help, as we naturally conceive it, is given through intimate one-to-one contact with the individual patient. There is current recognition that such an approach alone, barring the advent of miracles, is patently inadequate. Those needing help are vastly numerous. Those who can give it are few—and hard manpower figures tell us they will remain inexorably few. There have been and must continue to be attempts to combat the depressing logistics of mental illness through such procedures as group therapy, milieu therapy, community mental health programs, the manipulation of the environment as well as of deep intrapsychic dynamics.

11. The promotive segment of the mental health movement, for the want of something better, has adopted the pathologically flavored theories of personality and has unwittingly taken over some of the values and traditions of the medical segment of the movement. We do not have the concepts or the knowledge to deal in a systematic scientific way with the adequately functioning person. We tend to say that the happy and effective person is "well defended" or "free from conflict" or "has no

symptoms." These negative concepts may add little to our ability to understand or to facilitate the development of the normal person. The absence of theory and vocabulary for dealing with the effectively functioning individual may be one reason why we pay only semiembarrassed lip service to the positive side of living and slip quickly and comfortably back to talk about mental illness.

12. Fifty years from now with an accelerated growth of knowledge and with times ripe for the easy adoption of new ideas, our current theories and current technical terms may be of no more than mild historical interest like phlogiston or Watsonian behaviorism.

13. One way in which our pathological orientation may have shaped our thinking and prevented our progress in the areas of both prevention and promotion is through assumptions about the impotency of mere knowledge and mere ideas as factors in the living of a life. While it seems to be true that the sick person is unable to absorb and turn to the ends of health such things as rational argument, hard logic, and well-established fact, we may be underestimating the average person in assuming that he, too, is incapable of turning to constructive ends sound knowledge of the workings of his own personality. While we need to continue our research on one-to-one therapy, there is good reason to argue that we should aim for equal time for research on the communication of mental health information. Maybe we can find a way for the gifted analyst to affect the lives of 15,000 people rather than the 150 people who now occupy his professional lifetime.

Incidentally, it is with this bit of arithmetic that I like to illustrate what seems to me to be the need for concentrated attention on mental health communication. If we assume that there are 50 million parents and teachers in this country, a figure not far off the mark, and if we assume that each one of them makes 10 decisions a day affecting the welfare of the child, this adds up to 500 million decisions a day, or 182,500,000,000 a year. Many of these decisions are deeply rooted in the personal in-exorabilities of the parent or teacher and are not amenable to change, short of something drastic. Others are deeply rooted in the cul-

ture and are not open to change, but many of them can be changed through education, changed so that those who make them like their consequences better. But we do not know how to bring about the changes in these decisions, and there is relatively little hard, intelligent research being devoted to this kind of mental health problem.

14. There seems to be good reason to believe that society will continue to support both branches of the mental health movement. With direct and optimistic American vigor we have begun our attack on mental illness. There is no reason to believe this attack will not continue and will not meet with eventual success. The other branch of mental health, scientific humanism, seems also now in the blood stream of the culture and is probably there to stay. Developments in this area will be intricate. While there seems no reason in nature why man cannot turn to his own positive ends the knowledge reaching him through our advancing knowledge of his own behavior, he will not make these applications with ease and comfort. In new ideas about behavior there is threat as well as utility. And before we can raise good personalities or pursue the good life through scientific methods, we must wrestle with the intricate value questions involved in defining the good personality and the good life. We all can agree that illness is bad. There is no unanimity among us about the goodness of such things as spontaneity or freedom from conflict.

15. The role of the expert in mental health and the requisite skills will vary considerably from one segment of the movement to the other. There is a difference in role and in skills between caring on the one hand and in teaching on the other; between responsibility for and responsibility to; between the restoration of health and the provision of room for positive growth; between helping a desperate individual achieve survival and helping free and responsible persons pursue with verve and creativity their own personal lives.

There is room and opportunity, however, for each mental health discipline to find its socially functional identity and to live it out integrally.

16. It is frequently assumed that the vig-

orous and successful promotion of positive mental health will solve eventually the problem of mental illness. This assumption needs to be evaluated carefully. If it indeed seems a good assumption, then we need to bestir ourselves mightily to direct research attention to problems of promotion, and to pursue more vigorous exploratory programs of action in this area.

17. In both segments of the mental health movement, the enlightened citizen will play a crucial role. With respect to the care of the ill, the citizen and the community can and will serve as therapeutic collaborators with the

physician. With respect to the growing of mature and resilient personalities, with respect to the pursuit of the good life, the citizen must take responsibility and leadership, using as he sees fit the technical competencies of the scientists and experts.

18. Though many aspects of our future are clondy, this much seems eminently clear: Whatever the form and contour of mental health in the years to come, there is challenge and adventure here for anyone who wishes to invest altruistic effort in the on-going human enterprise.

Distress Signals

The public should learn to recognize warning signs of mental illness. Starting the list are eight signals. A person should seek help when he isn't himself for a month or so; when he expresses ideas that obviously don't make sense to others; when he acts, for a day or so, as if he doesn't know where he is or what day it is; when, for a period of a few months, he consistently makes people around him unhappy, angry, upset, or worried, without an acceptable explanation; when his drinking interferes with work or decent relationships; when he loses appetite and weight over a period of a month or so with no physical illness or need for losing weight; or when he has trouble sleeping to the extent that it shows in poor work, excessive irritability, or complaint.

—IVAN C. BERLIEN, M.D., *chairman of the Committee on Preventive Psychiatry of the Group for the Advancement of Psychiatry, addressing the 1957 National Health Forum.*



Training Professional Personnel for Mental Health Programs

PAUL V. LEMKAU, M.D.

Stimulation, not reassurance, was Dr. Lemkau's stated intent in his introductory remarks at the Northeast State Governments Conference on Mental Health, held at Asbury Park, N. J., in March 1956. Dr. Lemkau, director of mental health services of the New York City Community Mental Health Board, pointed out that his paper, somewhat condensed here, served only to introduce 2 days of discussion on mental health. Therefore, he felt that he could risk some statements that might prove arresting. "Perhaps," he said, "I shall only be revealing what I should like to be able to act upon if I were free of the usual restraints on the public administrator."

ADMINISTRATORS of community mental health services are by no means a new breed. They have existed as specialists in mental health programs for many centuries, generally as hospital administrators. In the last 50 or 60 years, outpatient clinic administrators have been added as specialists. Early in their development they were independent of hospitals. More recently outpatient programs have become more closely attached both to general and to mental hospitals. The third phase of the program, prevention and public education, has developed sporadically, but in relatively few places in this country have the three phases been combined under a single administrator.

The lead in making the mental hospital the

center of community mental health services appears to come from England where several hospitals and their communities have achieved fame for their extensive community programs. They have established a free flow of patients in and out of hospital and back and forth from the community. The hospital supplies staff for consultation services and outpatient clinics and sees to it that the community is educated to use the services.

This development has seemed more natural in the European system of administration than in the United States, perhaps because medical care and public health have always been closely associated in Europe. In the United States we have developed mental hospital systems independent of general and other specialty hospitals such as the tuberculosis sanatoriums. Health as defined in Europe generally includes mental health; in this country we have tended to think much more of mental health and physical health as independent classes of diseases to be administered by different kinds of specialists. It is probably not accidental that the development of psychobiology came in the United States; perhaps it was less needed, at least at the administrative level, in Europe than here.

On the other hand, in the United States organized public health programs have been reaching toward the ideal of comprehensive medical care and preventive programs. This

has been due in some degree to the control of the epidemic diseases which has left public health with leisure to face the emerging more important causes of death and disability such as cancer, heart diseases, suicide, and the various mental illnesses. Educational and clinical mental health programs within organized public health and vastly increased cooperation, both in personnel training and in planning, administering, and supplying services are rapidly appearing. In a few places, the European plan of grouping together all health services, mental and other, for administration is being tested. I doubt whether there are many people who believe that there should be anything but most cordial cooperation between all segments of health services: mental hospital, specialized hospital, public health services, including education and outpatient services.

Specialization

These trends point to the need for personnel who somehow can envision the whole range of activities of a mental health program, from prevention of brain damage by accident or infection to the care of the chronic case in the hospital. Delineating the sort of personnel required and how they should be trained is not an easy task. Frankly, I do not think the problem has been made less complex by the marked development of multiple professions within the psychiatric service team in the last decades. Frequently, these specialists early become the slaves of the restrictive definitions of their fields. They are almost bound to fail when faced with the problems of the community's total needs rather than that segment of need they, somewhat artificially, have defined as their particular area of specialization. This is no less true of my own profession, psychiatry, than of the rest. How many times have I heard my colleagues protest that they are therapists, usually meaning equipped to deal with neurotic patients, as though that relieved them of responding to the public's need for educators, helpful custodians, rehabilitators, or physiological therapists. I think this attitude is less prevalent now. The ideal of the "compleat" psychiatrist is more frequently an aim of training programs than it was 5 or 10 years ago.

Clinical psychologists are generally careful to distinguish between their field and social psychology. And it is a rare social psychologist who will consent to do more than study a population; he hesitates, frequently, at the threshold of "tinkering" with the forces and situations he does research upon. The clinical psychologist hesitates to act administratively upon the generalizations he frequently draws from his clinical experience, carefully gathering his research cloak around him and passing by on the other side.

Despite the emergence of the ideal of generic training, the social worker has also developed specialization to such an extent that artificial definitions protect him from going all the way in meeting needs of the public. On the other hand, the public health nurse shows a tendency, according to her critics, to respond to needs beyond her professional competence.

How can we remove the polarized lenses from educational procedures and let in to the trainees the full range of light that flows from recognition of the broad range of the public's need? Can this be done in the setting of traditional training patterns or must we develop a new "generalist" in the mental health field? Actually, there is something ludicrous in speaking of any of our present training patterns as traditional. Most of them are less than 50 years old. I am reminded of the college president who announced that on the following day it would become traditional for all male students to appear at chapel in coats and ties.

Shall this broad-visioned planner and administrator be produced by an entirely separate training program, or is it possible for him to be trained through modifications of present training programs? And for the immediate situation, shall the training be additive, on the base of previous specialization, or should it be an entirely new program, starting after the acquisition of the degree in medicine and during the graduate education of the other specialists? And which specialists should be considered as eligible for this training?

When it was my privilege to study with Adolf Meyer, I was struck by the fact that he regarded medicine as basic education and not, as it is for many, terminal education. Had he had his way, all psychologists, sociologists, an-

thropologists, and high-level administrators in any health services, and even in law and public administration generally, would have been trained first in medicine. In my own time, this idea resulted in the education of Norman Cameron, a psychologist now reverted to psychiatric teaching, and Alexander Leighton, a psychiatrist with the added competence in anthropology, among others. Meyer, along with the American Psychiatric Association, never believed that a psychiatric hospital could be as well administered by a nonphysician as by a physician. This did not so much represent a species of professional acquisitiveness as it did a conviction that the discipline and knowledge of medicine were essential to the understanding administration of services to humankind.

In America, medical education has so expanded the basic academic requirements and the length of the medical course itself that the concept of a medical education as a background for other fields has proved largely impractical. On the other hand, medicine, unlike the other disciplines producing workers for the psychiatric team, adds specialty training on top of the degree training; the others tend to specialize and then grant the degree. The psychiatrist starts his training as a specialist only after his medical education is achieved.

Will it be possible to include training for specialties within the medical school and before the degree is gained? Certainly not by present methods which require both practical and theoretical knowledge of the student in all fields of medicine. It might be worth while to place the rotating internship within the 4 years of medical school, but such a plan is not tolerable to the ideals of general medical education at this time. However, the rise of departments of preventive medicine within medical schools has included in the undergraduate medical curriculum a great deal of material about how people live and organize their lives, both health-wise directly, and indirectly, as sociological patterning affects health status. Preventive medicine courses approach more closely than any other in the medical school the additional content needed by the mental health administrator. The courses present, in my estimation, the basic science underlying the specialty of psycho-

genic psychiatry, though no course including such material has developed in psychiatry departments to my knowledge. The impulse has come largely as an extension of the specialty of public health or of pediatrics as influenced by etiological thinking originating in the specialty of psychiatry. The development of curricula in preventive medicine, including the observation and medical care of families, opens new challenges to medical students and may whet the appetite of some to accept challenges in program planning and administration in all fields of health, not excluding mental health.

Psychiatric Training

We are emerging from a period of psychiatric training in which the aim has been too exclusively the development of skill in individual psychotherapy. In this period, the psychiatrist's responsibility has been narrowly defined as including only his relationship to the individual patient and his needs. In training centers designed along these conceptual lines, it has been possible for a psychiatrist to finish training with no awareness of the place of the State mental hospital in filling the needs of the community or of the enormous task that confronts these hospitals.

The unrest of Meyer and, later, Harry Stack Sullivan with psychiatric isolationism, plus the war and the training and administrative weight it brought to bear, has largely been responsible for the general abandonment of this exclusively individualistic type of psychiatric training. Karl Menninger has suggested that no psychiatrist should be considered qualified until he has had a year of State hospital experience or its equivalent. This sort of thinking has led to a new status of State hospitals in psychiatric training.

Training in psychiatry in university settings has always included outpatient care, and this has generally forced some study of the community. Too often in the past, however, outpatient treatment has been regarded as an irksome chore, robbing the hospitalized patient of the doctor's time. This pattern, too, is changing with the clearer perception of the outpatient department as a way station between the hospital and the home. Many State hos-

pitals have also developed outpatient services, first, to follow up discharged patients; second, frequently, to meet training requirements; and, too often last, to serve community need. It is surprising how often these clinic arrangements become relatively independent of the hospitals. It is as though the psychiatrist who is responsible for inpatients could not also take care of outpatients. This is, I fear, more often an administrative convenience than evidence of sound planning.

We have seen that medical education is changing and that it may produce physicians more aware of community needs and with more sociological knowledge than it had before. Specialty education of psychiatrists is also focusing more attention on family and community forces in etiology and treatment, and it is recognizing that one person should be able to coordinate the services from education of the public to the rehabilitation of the recovered or recovering patient.

Public Health Instruction

Public health education attempts to keep abreast of the developments in medicine, reducing those with practical application to programs for all the people. There is a growing recognition that mental health is a part of general health and that the techniques and methods available must be applied to this health problem. If present methods are not suitable, new ones must be developed to satisfy the need. Schools of public health, like all other educational institutions, are constantly faced with the issues of how much they are responsible for teaching immediately practical techniques and how much their purpose should be to enlarge the vision of their students so that the blinders of technical skill will not prevent them from seeing the unsolved problems where experimentation and testing, research and application are so necessary. The aim of public health education is to develop competence in comprehensive medical planning and administration; it is not training to furnish services primarily.

It has been frequently suggested that public health training should be required for mental health administrators, that it should be added

on top of psychiatric training for those who intend to make a career of mental health administration. In this way the psychiatrist could not escape the broadest possible implications of his task, and he would, in addition, gain technical skill in epidemiology, biostatistics, and public administration. In a very few places, training in schools of public health has been carried out under the supervision of psychiatrists thereby keeping the implications in the mental health field before the student as he learns his basic public health methods. In such instances, some proportion of the public health training may be accredited as psychiatric training.

Some have felt that there is no need for the base in psychiatry, that the public health school ought to be able to see to it that competent administrators of programs are produced without the clinical background. I feel that general medical education is too weak to provide the necessary background of the pathological anatomy and physiology of mental illnesses on which to build. Combined public health and psychiatric training, perhaps replacing the third year of residency training, is much to be desired and should be encouraged for those who are able to catch the vision we have before us.

Related Professions

What of the other psychiatric team professions? Like social work, nursing is turning to the ideal of generic training designed to make every nurse competent on the staff level in public health, psychiatric ward, and operating room functions, among others. Specialist consultants are developed in these fields to keep interest aroused and to promote the functional growth of the nurse. One such specialist, the public health nurse consultant in mental health, has come to the fore in the years since the war. These specialists have the aim of improving the staff level nurses' function in psychiatry and in mental health education and counseling. They are being educated in nursing schools and in public health schools. Evident in the last few years is a movement toward training this specialist in conjunction with those specializing in psychiatric nursing, a movement that makes sense only if the hospital (and the other pro-

fessions concerned) foster the expansion of the function of the psychiatric nurse to include services outside as well as inside the psychiatric ward.

Psychiatric social work, perhaps more than any other profession in the team, has attempted to include the operation of the community and the place of mental health in that operation in its training. It has also included administration in its basic training and in postgraduate courses. Perhaps because of this, psychiatric social workers are proving successful administrators of clinics and, in some places, of the entire program of community mental health. When they rise to positions of leadership of large departments of welfare, they show such sound usage of psychiatric diagnostic and treatment services. Sometimes this opening of doors to the student while in training is followed by a resounding slam by supervision that is too vigorous, too long, and too restrictive after the worker goes into the field. As a result, the range of productive activity is narrower than what the social worker was originally prepared to do. There remains some doubt as to whether the profession of social work can supply personnel for the overall planning and administration of medical services, however. I must admit to the conservative view that such leadership should be sought from the medical school graduate who goes beyond his educational opportunities in medicine to grasp, formally or informally, a view that includes broad public health ideals.

Clinical psychology, too, has broadened its outlook to include much more of community interest and knowledge, though this profession generally appears to have shunned administrative responsibility, allowing the leadership to rest primarily in medical hands.

In each of the professions other than medicine, the structure of training for understanding and manipulating community forces is being included in the undergraduate as well as the postgraduate courses. It remains a moot point whether such inclusions result in a genuine overall public health viewpoint that can provide administrators for mental health programs from the nonmedical field.

A controversial area of mental health work is the responsibility for public education. Should

this be done by educators? We have seen the growth of the idea that educational methods are of extreme importance and that they may, in some instances, be almost as important as the content. Furthermore, many other health fields have profited from the use of nonmedical health educators. The professions previously discussed are all concerned with content and primarily individual or small group interrelationships, not with teaching methods to get that content into the minds of the public. What should be taught remains a much more controversial subject in mental health than it is, for example, in nutrition. And many medical and paramedical persons are unwilling to risk putting this decision into the hands of people whose fundamental qualification is in method rather than content.

There is scarcely a statement in this paper so far that cannot be refuted by a successful experiment involving a specific person doing a job outside of his professional competence. As a matter of fact, most of us are doing things for which we were never trained; we have seen an opportunity and grasped it as well as we could. It has often been pointed out that Freud could not qualify as a psychoanalyst since there was no one to analyze him and no institute to qualify him. It behooves us to realize that, however much we may wish to rely on the rather mystical safeguards attributed to special education, every new venture requires people with special vision as well as special training. In new programs it seems to me to be of the utmost importance that we keep civil service requirements as flexible as possible, so that we can hire the "gleam in the eye" as well as the degree on the diploma. This is no easy task.

Conclusions

I would plead that we regard education in the various fields as insurance against foolish and ill-advised experimentation. It cannot be regarded as insurance of productive, creative thinking. In a field so new and varied, flexibility in the use of content and method is as important as knowledge and methodological skill. It is wise to recall that in some people training kills creativeness by narrowing the

range of perceptions the individual can make; such people may be excellent for carrying on jobs for which the ground rules are well known, but they are not useful in facing the newer problems in our field.

Some day mental health work will have a relatively fixed range of content and activity; then education for it may be possible. Meanwhile, one needs only to look at the brief his-

tory of the field to see that it is much more dominated by personalities than by solid ideas. So long as this situation exists we shall have to be concerned about an educational program that provides wide knowledge and broad vision as well as technical competence. And our selective processes will use light meters to detect the intensity of the "gleam in the eye" as well as civil service type of requirements.

Mental Health a Hope, Not a State

Mental health is the concept of a hope, not a state. We can collect statistics on mental ills, on ties and ulcers, hallucinations and homicidal impulses, sex crimes, and pathological theft. But we will never have statistics on mental health, for each new question will change the face and the position of the target. The term is used in our culture to indicate our hope of what good may come from a greater knowledge of the way in which men's lives are shaped by childhood experience, by relations with others, and by the forms of the societies in which they live.

The good can take many forms: maternity hospitals organized so infants are not separated from their mothers at birth, children's hospitals in which there are specialists to help a child at the first moment of breakdown, community diagnosticians alert to developing hazards in park or neighborhood and to new needs for association, or places to play, or places where the aged can sit together in the sun. The good can take the form of new ideas of housing in which the need of each individual for privacy will be seen as a matter of mental health rather than of minimum standard of decency and physical health alone. The good may express itself in new standards of ethnic relations or new forms of education which will prevent one sex, or one age, or members of any class from being turned into second-class human beings.

—MARGARET MEAD, Ph.D., *president of the World Federation for Mental Health, addressing the 1957 National Health Forum.*



Inpatient Services for Children

DONALD A. BLOCH, M.D.

IN RECENT YEARS, there has been constantly increasing pressure to provide mental health facilities for the care and treatment of a group of children who cannot be adequately dealt with on an outpatient basis. These children, for the most part, are in the 5- to 15-year age group. Allowing for difficulties in diagnosis, the group includes cases that may be classified under the broad headings of schizophrenia, severe psychoneurosis, and the behavior disorders. By and large, it excludes cases showing mental retardation—although there is serious doubt whether they should always be excluded—and, also, cases showing manifest organic pathology of the central nervous system.

This pressure has shown itself in many ways. More and more children have been referred to the few facilities which have residential treatment programs; normal foster care institutions indicate an increasing awareness of specialized treatment needs in the children for whom they care; and those State hospitals admitting children find themselves with a steadily growing patient population in this age group. It is my impression that this trend is related more to increased diagnostic skills

and broader treatment perspectives than it is to a change in the incidence of severely disturbed children in this age group. It also reflects an increasing professional conviction that the small institution giving intensive treatment has something special to offer to these children.

If we take an overview of the field of inpatient mental health services for children, we are confronted with a confusing array. The facilities go by many names: psychiatric hospitals, training schools, and residential treatment homes or treatment centers. Their treatment programs may include all or none of the organic therapies, remedial education, individual psychotherapy, group therapy, or casework with families; their goals range from diagnosis on a short-term basis through long-range custody and on to active treatment programs. The institutions may be integrated with other community treatment facilities or may be in extreme isolation. The staff may be professional or not, under medical direction or not. The institutions may be large or small, ranging in size from only 20 beds to more than 200. And, finally, the children display the most disconcerting heterogeneity. At the very least they are both boys and girls, but in addition they range in age from 2 to 15, in symptomatology from severe aggressiveness to extreme withdrawal, and they fall into many diagnostic categories.

By and large, there has been the parallel but isolated growth of three classes of institu-

Dr. Bloch serves as consultant on treatment centers for emotionally disturbed children with the New York State Mental Health Commission. The paper was presented at the Northeast State Governments Conference on Mental Health at Asbury Park, N. J., in March 1956.

tions, each with its own philosophy, each believing that it is dealing with a discrete and separable group of children. These three classes of institutions are, broadly, psychiatric hospitals, dealing medically with mentally ill children; foster care institutions designed to care for the normal dependent and neglected child; and training schools and their counterparts, essentially caring for the aggressive, antisocial, or delinquent child. Of principal importance at the moment is the parochialism that has resulted from this development—a parochialism that affects conceptions both of the child and of the treatment process. Thus, the child is thought of as mentally ill and therefore the province of the hospital, or as emotionally disturbed and belonging to the guidance clinic or social agency, or he is delinquent and belongs to the courts and training schools. Correspondingly, the psychiatrist often is woefully ignorant of the importance of such things as the social structure of his institution or case-work with the family of a disturbed child; the social agency often is unable to integrate modern psychiatric knowledge into its program. While things have been changing for the better, it is only fair to recognize that we have inherited this splitup view of the child and of treatment, and that it is a handicap. Moreover, power and prestige considerations make it difficult to give up a position once it has been taken.

Inpatient Facilities

Of specific relevance to State planning are the following questions, which are, however, of a partial and limited character. Where appropriate the brief answers include a discussion of the treatment factors underlying the particular point of view expressed.

What children should be considered as potential patients in an inpatient mental health facility?

All children whose difficulties are of a psychological and behavioral nature and who must be treated outside the community should be considered as a group. Distinctions between them must indeed be made, but they cannot be made on diagnostic grounds. These distinc-

tions can only be made on the basis of differential treatment needs.

Where should it be located geographically?

All institutions for children should be in the community they serve. Centralization of such services is a false economy. Sparsely populated areas might provide the one exception to this rule, although even here I would urge serious attention to the possibility of setting up decentralized, smaller units.

What is the optimum size for such an institution?

With regard to size, 20- to 40-bed units seem to be optimum.

What should its auspices be, and how should it relate to other community services for children?

It is of the highest importance that such inpatient facilities be part of an integrated network of services to children. In most instances, it would seem to be desirable for this network of services to be operated under community, rather than State, auspices. There should be a close, systematic, and free-flowing relationship between special school programs, day hospitals, child guidance clinics, foster care programs, family agencies, and a range of inpatient mental health facilities for children.

In order to discuss the desirable characteristics of the inpatient facility itself, it is useful to outline some of its qualities in terms of a comparison between the large, centrally operated State hospital setting as opposed to the smaller, decentralized institution giving intensive treatment. The standard used is the relative capacity of the two types of institutions for meeting the treatment needs of the children for whom they care. This is not to say that other standards are not pertinent. Cost and administrative feasibility, among others, pertain, but the choices will be discussed here principally in terms of their clinical effectiveness.

To be therapeutically effective any institution dealing with children must have certain characteristics. While some of these characteristics are more important for one type of child than another, in the main they may be thought of as common to all good facilities.

The institution must be able to create an atmosphere which is hospitable to child life. To use Fritz Redl's phrase, it must be "psy-

chologically hygienic." While the concept of atmosphere is elusive at best and can be achieved or missed in countless ways, it represents a summary judgment on such matters as location, architecture, grounds, decoration and furnishings, available materials, and the attitudes of patients and personnel toward themselves and each other. Recognizing that this quality is dependent upon a multiplicity of factors, in a general way by atmosphere we mean our understanding that a particular institution is or is not a good place for any child to live in. This quality may generally be described by such adjectives as "warm," "supportive," "tolerant," "kindly," and "flexible."

The development of therapeutically meaningful adult-child relationships is of key significance in the treatment of most of these children. We would wish to see them develop with a number of different people: the child care worker, teacher, psychotherapist, caseworker, and group worker. Recognizing once again the wide variations as to philosophy and technique on this point, the *sine qua non* for such relationships is a high personnel-patient ratio in the institution, along with the opportunity to employ personnel suited by personality and training to this type of work. On both of these counts, State hospitals are at a disadvantage. While there is some flexibility as to personnel ratios, this tends to be limited by standards set elsewhere in the State hospital system.

So far as the caliber of the personnel is concerned, the problem here, among others, is fitting a new profession into on-going civil service practices. Touching only briefly on this complicated question, it may be pointed out that the profession of counselor or residential child care worker is in the process of development. For some time, we will look to many disciplines to provide us with workers in this field. It is difficult to do this within ordinary civil service procedures. In addition we are looking for people who are equipped with certain intangible personality assets which suit them to this work. We wish, as Dr. Paul Lemkau has put it, to be able to hire "that gleam in the eye." On both of these scores, maximum freedom in personnel practice is highly desirable.

Tolerance, flexibility, and individuation must

characterize the institution. These three adjectives are chosen from what might be a considerably longer list to describe qualities of the institution which may be thought of as especially therapeutic, and qualities especially relevant to the size of the institution. It is the goal of a residential treatment setting to be something different from residence plus treatment. It should not be thought of as a hotel where one lives while receiving psychotherapy. The purpose, rather, is to use all aspects of the child's life in the institution for therapeutic purposes. To this end, it must have, among other things, a high tolerance for the symptomatic expressions of the child's illness and a great deal of flexibility so that it can manage his life according to clinical indications rather than some standard practice. As a simple illustration, we might take visiting. The needs of a large institution usually dictate a fairly regular visiting schedule for parents while home visits for the children are often difficult to arrange. Clinical considerations, however, may indicate flexibility in this area. Other examples would be bedtime routines and arrangements about food. In the most general terms, we can say that the institution must be small enough and communication between its component parts must be good enough so that clinical insights gained in one area can be transmitted to, and acted upon by, the other people who have contact with the child.

The institution must be able to carry on a therapeutically oriented program with the families of the children it serves. Perhaps no other point speaks more forcefully against the establishment of institutions for children which are removed any distance from the families of the patients. Regardless of one's therapeutic orientation, one cannot hope to treat children successfully and at the same time disregard the context in which they have become ill and to which they must return. Even those children who will not be able to return to their families will be profoundly influenced by them. It is necessary, therefore, that the institution be physically accessible and, in addition, have staff members who have the time and skill to maintain contact with the families in such a way as will be useful to them and their children. In addition to location this is a matter of staff

ratios and the caliber of personnel. By and large, it is quite difficult for large institutions serving a wide geographic area to maintain frequent contacts with the families of their patients, and it is frequently difficult for them to hire a staff for this purpose in the numbers required to do an effective job.

The child's separation from the community, and his return to it, must be managed in a therapeutically effective way. These are often crucial periods having great effect on the child's willingness to accept treatment and his ability to succeed after leaving the institution. These special instances deserve mention because they bear particularly on the question of location. It is especially valuable, for example, for a child to make preadmission visits to the institution in order to become acquainted with it, and it is also valuable for the return to the community to be a gentle transition. To the degree that he can, for example, return to a public school, join a Boy Scout troop, and so on, before actually leaving the residence, the final separation is more likely to be successful.

In a variety of ways, a close interrelationship with an inpatient mental health service can be of great value to a community. It can keep allied professions informed on the child care needs that it perceives in the community by virtue of its special position as an "end of the road" institution; it can serve as a site for research; it can be a training instrument for a range of professions.

An institution giving intensive treatment can be quite valuable, for example, to normal foster care institutions. We know that these congregate care institutions are serving a different population today than they did formerly. The wider availability of services holding families together, the decreased number of orphans, better economic opportunities, and the increased use of foster homes have all operated to reduce the number of "normals" in the "normal" foster care institution. The remaining children are almost all deviant. By sharing information with these institutions, the residential treatment home can augment their capacity for dealing with disturbances in the children they serve.

On the question of cost, one of the chief points in favor of larger, centralized institu-

tions is that they can be run more economically. It is apparent, however, that this applies less directly to the sort of treatment institution for children with which we are concerned here. A large measure of the increased cost of such an institution comes directly from personnel costs. These are not amenable to reduction without actually reducing service. Consolidation and centralization will be effective in reducing costs only so far as they apply to administration. Moreover, the decentralized institution is in a position to use many already established facilities, such as schools and recreational resources, at little or no cost.

Role of the State

What, then, is the proper role of the State with regard to the development of this type of service? It may be outlined as follows:

Within the population served there are differences in age, sex, symptomatology, and treatment needs. A balanced program within an institution and a balance of institutions within the State need to be maintained. Leadership in this regard on the State level is important. There is a natural tendency to respond to the most pressing need in the community first. This means that other classes of children will not be cared for. By and large, the first group served are the 9- to 12-year-old aggressive boys. Next come the younger borderline and schizophrenic children. Girls, mostly, are not served. The older children in the 13- to 16-year-old range, with special problems of manageability, treatment, and security, are usually not dealt with. It is therefore the obligation of the State to exert influence to create a balance in the types of institutions.

On the State level, interdepartmental coordination must be approached by integration of related State departments—mental hygiene, social welfare, education, corrections, and health. This structure will, of course, be different from State to State, but there is a universal need for a multidiscipline approach on the State level, enabling local counterparts to develop and function.

State leadership and supervision are needed

in order to set and maintain standards for residential treatment centers. There is a tendency for everybody to climb on the residential treatment bandwagon. To some extent, this is financially determined. An institution with an inadequate program and a dwindling population may, in all good faith, feel that by hiring a part-time psychiatrist it has converted itself into a residential treatment home. In a more general way, the newness of the field and the lack of adequate clarity as to the necessary professional competence make it necessary that an on-going high-level process of setting standards and maintaining them be carried out.

The problem of staffing inpatient mental health services is a complex and difficult one. We are dealing here with a relatively new field without reliable traditional sources of personnel. A wide range of professional disciplines is involved, among others, residential child care workers, psychiatrists, psychiatric nurses, social workers, and special education teachers. In order to train people for work in this field, financial support during the training period and the development of stimulating training programs must be undertaken. While individual institutions have an interest in and responsibility for the maintenance of such programs, assistance from the State will be required for their full development.

The extent and nature of financial support

certainly need to be debated to the degree that it provides one of the levers for starting services and for maintaining their quality. Policy in this area has extensive implications. It is clear, however, that in addition to the training grants described above, some money must be available on a State level for the addition of those services which will enrich and make therapeutic the residential program. It may very well be, too, that capital construction funds, which would have been ordinarily directed toward the development of large centralized institutions, should be made available for the conversion of certain congregate care centers for their new role as inpatient mental health facilities.

There is considerable debate as to whether a State should make capital construction funds available to local communities or agencies. In general, it has been a principle of administration in New York that the State should run any institutions which it constructs. At the same time, communities need assistance for this purpose.

As for professional leadership, there are 15 unanswered questions in this field for every one we think we know something about. Providing professional leadership and research, pooling and communicating experience—all these are continuing and on-going obligations of a State department.

PHS Employs Engineering Students

Fourteen college and university engineering students have been selected for summer employment by the Public Health Service under the commissioned officer student training extern program.

Engineering students are included for the first time in this program, designed to attract young people to careers in public health.

Students recommended by their deans apply for reserve commissions as trainees in the Public Health Service, where a review board passes on their qualifications and references. Those selected are assigned to Public Health Service programs at the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, the National Institutes of Health, Bethesda, Md., the Communicable Disease Center, Atlanta, Ga., the Division of Indian Health, Washington, D. C., and various regional offices.

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- His social behavior in certain key roles, such as his relationship to his family, work, community, and his education.

It is recognized that the mental health of the particular person in relation to these discussions might be rated differently by himself, his associates, and by the professional mental health people with whom he might come in contact.

We decided to consider the things that make people ill, and those that keep them well and make them better than average. Ideally, such a study would encompass a detailed biological, psychological, and sociological study of each individual as a person and in relation to his family and peer groups. The study would further include the relation of these groups one to another, and the effect of the groups on the individual in his experience of living.

Since such a study is not feasible within the finances and time of the commission, perhaps not within the lifetime of a single individual, certain compromises and hypotheses were necessary in order to trim the task to workable size. In the first place, we hypothesized that the majority of individuals living in this world express some phases of their biological and psychological vigor in their behavior in, and effect upon, certain significant social institutions.

We customarily say that these social institutions have a significant effect on an individual. Each person is modified somewhat in his own makeup and in his reaction to others by the active presence of the others. A person in exuberant mental health often expresses this in ways that are observable through the significant social institutions; for example, by achievement in school, by adjustment to his family, by success in his job, and his support of community agencies that aid persons less fortunate. The ill person or one who is troubled from a physical, psychological, or social point of view frequently turns to similar institutions for help, or within such groups displays the symptoms of stress. Therefore we thought it logical to make studies of as many significant social institutions as time and money permitted.

Accordingly, we have set up studies of the schools and their relation to well children, to mental health promotion, and to support of

troubled or ill children. These schools are to be studied not only in relation to the effect on the children, but also the effect of the community on the school and vice versa. Obviously, such studies include school administration and faculties.

The hospitals and clinical services to which ill persons or those in trouble turn are also the subject of study. The role of private practitioners, of health clinics, and of similar agencies will be a part of these studies, as will those agencies devoting themselves to treatment and rehabilitation of the mentally ill.

The nonmedical community resources such as family service societies that aid persons under stress are the object of another category of studies. We are also interested in agencies trying to promote mental health or foster ego growth. Among these are the schools, recreational agencies, community betterment agencies, and others that may influence positively the living conditions in a community.

At present, five studies of the significant social institutions with which people interact are under way. As a further check on our concepts and in the belief that some individuals when troubled find strength within themselves or seek help from informal or unorganized community resources, a nationwide sampling survey is being made to determine the extent of worry, concern, and tension under which people live, the source of these stresses, insofar as it is possible to determine in a sampling survey interview, and the sources of relief or support these people find, either within themselves or within their community. This should give us some information on the prevalence and nature of people with problems in the Nation, and the extent to which they seek relief from organized resources, and from informal and as yet incompletely understood resources.

In addition, the Nation's resources of a more basic sort are being studied. These studies encompass research activities in the field of mental health, the nature and basis of this research, and the staffing of research units and their support. The manpower problems, the numbers of professional people available, and the efficiency of their use will be examined. From this may come realistic assessment of the



A Case for the Community Self Survey

JACK R. EWALT, M.D.

The Joint Commission on Mental Illness and Health presents some of its guiding concepts and a broad view of its activities. It encourages communities to study mental health problems in their own areas and to assess local resources available to cope with them.

MANY agencies have become increasingly concerned about the status of the mental health of our people and of the facilities for meeting the difficulties they seem to develop in today's society. In addition, the people of the Nation themselves have a manifest desire to do something about the mental health problem. As a result of these pressures, approximately 34 organizations joined to form a nonprofit, research and educational group called the Joint Commission on Mental Illness and Health. Funds supporting the operations of the commission were authorized by the Mental Health Act of 1955, under which specified allocations are made out of the budget of the National

Institute of Mental Health, Public Health Service.

The goal of the joint commission is to develop an up-to-date estimate of the extent of the mental health problems in the Nation and to assay the facilities available for detection, treatment, and rehabilitation of the mentally ill. A further aim is to study the resources of the Nation for mental health promotion and prevention of mental illness.

Concepts and Projects

The commission resolved that the concepts of mental illness and mental health should be broad, not confined entirely to the concern of professional people who deal with formal resources for mental illness and health.

To approach such a vast project in an orderly manner required careful planning of the study based on concepts founded in current knowledge. Basically, the human being is a biological entity with his own peculiar physical and psychological structure, living in a world full of other persons and resultant social pressures. To understand this citizen we need to study:

- Intra-individual or personality factors based in biology and involving perception of reality, the extent of personality integration, and the degree of satisfaction from the individual's basic drives.

Dr. Ewalt is director of the Joint Commission on Mental Illness and Health, and commissioner, Massachusetts Department of Mental Health. The paper was presented before the National Health Forum in Cincinnati, Ohio, on March 20, 1957. Among other principal contributors to the ideas embodied in the paper were Dr. Fillmore H. Sanford of the commission and Gordon Blackwell, chancellor, Woman's College of the University of North Carolina.

- The effectiveness of the various social and professional agencies and the relation that degree of effectiveness bears to the particular socioeconomic and cultural features of a community.

- Drafting proposals for the next steps based on data obtained in the first four studies and formulating long-range goals in each community.

Such a scheme can be accomplished with cooperation, work, and money.

The time and cost of the study would vary with the size of the community, its complexity, and the nature of its problems. In a smaller community in which the formal part of the study would be completed in 1 year; the cost would probably range from only about a few thousand dollars in the smallest communities to

50 or 60 thousand dollars in the larger ones. In some communities these sums equal the amount appropriated for the family service society or for the child guidance clinic; they are small, however, when compared with the total cost of mental illness to any community or with money wasted through creating services without an overall concept or plan of the services needed to solve these problems in a particular community.

We will never have a complete concept of the mental health processes of the Nation, nor will we have a sound platform with which to launch reconstructive services, without this community participation and involvement. We hope many of you can initiate such studies in your own areas.

Mental Health Education

Anxious and impulse-ridden America needs not so much the treatment of diagnosed cases as the prophylaxis of mass suffering by public health methods.

A population suffering chronically from modern technology and its byproducts and from a tendency to let infantile emotional values dominate the traditional values of mature thought requires instruction in secondary schools and colleges by personnel specially trained in mental hygiene. Recommended in lieu of the past practice of case finding and treatment in the schools are courses in the management of tensions that disrupt social life.

Train children so that they will grow to be understanding husbands, wives, and parents, who will cooperate with one another in the mutual management of family emotional problems . . . so that America will assume leadership of human international understanding.

—JULES HENRY, Ph.D., *professor of anthropology, Washington University, St. Louis, addressing the 1957 National Health Forum.*

needs for the various categories of trained people. Then there is the difficult question of where to recruit them.

Community Studies

It is obvious that a nationwide sampling survey will give data relevant to the Nation as a whole but not to any particular community. Yet data for particular communities are urgently needed.

To attain a true concept of the national problem we need enough detailed community studies to be able to make comparisons between various geographic, socioeconomic, and cultural areas of the country. We know, however, that the professional resources available to work with mental health problems are woefully inadequate and that research has not yet turned up sufficiently firm data to enable us to publish booklets telling a community how and what it should do to solve all of its mental health problems. In fact, the mental health problems of communities have not been clearly delineated. One suspects that often a community believes that all its misery, grief, and economic problems would somehow be magically solved if it had adequate mental health services.

I believe that effective mental health services, either for health promotion or for prevention and treatment, should be at the community level. The nearer they are to the source of the symptoms, the individual, and the group within which he lives, the more effective they may be. Also individual differences in communities would modify the best plan of attack for handling such problems in any particular area.

For these reasons, then—the need for detailed local data for comparative purposes on a nationwide scale and the community's need for local data for intelligent planning of health promotion and treatment and rehabilitation services—it is desirable that we have surveys or studies of as many individual communities as possible in a wide variety of areas in the Nation.

A single study team to make a series of such studies might be ideal in terms of providing comparable data. But unfortunately, by the

time a team could complete all the studies, social changes in the first area of study would have taken place, and the comparisons would no longer be valid. A more workable substitute would be simultaneous studies by many communities. Data from simultaneous studies will be comparable if the communities each use the same blueprint for the study and thus examine corresponding agencies and factors; and if the studies are conducted by professionally competent persons in each instance.

The joint commission at present lacks funds to finance community studies of this type, although it is prepared to act as consultants to local groups. In any case, the studies will be better accepted and more effective in bringing about productive changes in the community if they are financed and carried out locally.

The commission will aid a community in planning the preliminary community meetings necessary to create interest in the study and to get the cooperation of local community services, agencies, and citizens. It will help select and recruit the trained professional staff necessary to carry on such a study, probably the most difficult phase in preparation of the study, and will advise in setting up the study plan so that the results may be comparable with those in other communities.

A study design might be built around the following major areas:

- The nature and extent of the community's mental health problem. This would take into account not only the mentally ill, those under treatment in hospitals, clinics, or private practitioners' offices, but also the juvenile delinquent, and the alcoholic, the improvident, and otherwise maladjusted person.

- The community's agencies as resources for dealing with such problems. Some assessment should be made as to whether or not these resources are adequate in support and staffing or whether they function according to a poorly organized, ineffective, or repetitious pattern.

- The community's resources and activities for mental health promotion and for the prevention of mental disease. These encompass not only health agencies, but also those tending to build resilience of character and the ability to stand the inevitable stresses and buffets of life.

without producing sleep. The tranquilizing effect has been reported to be of value in the treatment of hospitalized psychotics by diminishing disturbed behavior without preventing patients from continuing to take part in psychotherapy, occupational, recreational, and other forms of therapy.

Tranquilizers are being widely used not only in mental hospitals but also in general medical practice. For example, the Health News Institute released an estimate that 35 million prescriptions will be written this year for tranquilizers. Medimetric Institute, Inc., a New York pharmaceutical market research firm, reported that 3 of 10 compounds prescribed most frequently by physicians in 1955 were tranquilizers.

The tranquilizing drugs have been heralded as opening a new era in psychiatry. Although these drugs have such a potential, many facts are needed to assess the public health and social consequences that may arise from their widespread use. The question might be asked as to why the widespread use of these drugs concerns the public health professions. Several reasons can be given:

- They highlight a type of toxicity that the medical profession should be increasingly aware of—psychological or behavioral toxicity.
- They can have a tremendous effect on the mental hospital population of the Nation, solving and at the same time accentuating problems of treatment, staffing, followup services, and future building requirements.
- They can have a considerable effect on the organization of community psychiatric services and other forms of medical care.

Tranquilizers can produce not only biological side effects, such as jaundice, agranulocytosis, and a Parkinsonian-like syndrome, but also psychological side effects. For example, severe depression with suicidal tendencies has occurred in some persons treated for hypertensive vascular disease with reserpine and other rauwolfia products.

A point of major emphasis at the recent Conference on Evaluation of Pharmacotherapy in Mental Illness was that animal methods are at present poorly developed not only for predict-

ing certain types of toxicity in such tissues as the liver, skin, and bone marrow—tissues especially affected by some of the drugs currently used in mental illness—but also for predicting behavioral toxicity in man. The question is how does one translate behavioral effects produced by drugs in animals to expected behavioral effects in man. In addition, it is possible that some drugs will not affect animal behavior but will affect human behavior.

Behavioral toxicity of drugs is of public health concern. It is urgent, therefore, that we learn more about other psychological effects of tranquilizers as well as their biological effects. For example:

Are many persons in the industrial population on these drugs? If so, how are their reaction times and learning abilities affected? Are such persons subjected to higher accident risks than persons not on these drugs?

Is it safe to permit persons to drive automobiles while on these drugs?

Are these drugs being used as a sedative for children? If so, how do they affect "normal" psychological and emotional development of children? What effect do they have on learning processes?

Do these drugs produce any damage or cause changes either in the central nervous or other organ system so that persons on these drugs will be more susceptible to attack of mental disorders or other types of diseases?

Because of the magnitude of the problem of the hospitalized mentally ill, hospital administrators and public health, welfare, and other governmental officials are interested in finding some way either to reduce first admission rates to these hospitals, to effect a higher release rate, or to keep readmission rates low and thus eventually to decrease the size of the resident populations. The tranquilizing drugs possess some of the necessary properties of an agent that could achieve such results. However, much more information is needed about processes operating in society that lead to hospitalization and about the factors in the hospital and in the community that lead to release before any major portion of observed differences can be attributed to the tranquilizing drugs.

Between 1940 and 1950 there had already been striking variations—and, in several in-



Ataractics

THE WIDESPREAD USE of tranquilizing drugs and their public health consequences was the topic of a roundtable discussion at the November 1956 meeting of the American Public Health Association in Atlantic City. Appearing on the following pages are briefs of the papers of the five panel members who have been working in services that have been affected by the use of these drugs and of the introductory and summarizing remarks of the panel's co-chairmen, Dr. Morton Kramer and Dr. Roger Howell. The session was sponsored by the Mental Health and Public Health Nursing Sections of the American Public Health Association and the Committee on Public Health of the American Psychiatric Association.

Questions Posed by Use Of Tranquilizing Drugs

brief In the past 2 years a new series of drugs has assumed an important place in American medicine. These drugs are referred to as the tranquilizing drugs or the ataractics, a term derived from the Greek *a-taraktos*, meaning "not disturbed."

Some of the more important of these com-

pounds are: chlorpromazine, a phenothiazine derivative developed in 1950 in France, which became available for clinical use in the United States in 1954; reserpine, a purified alkaloid derived from *Rauwolfia serpentina*, the root of which has been used in India and adjacent countries for years for various disorders including insanity; and meprobamate.

The tranquilizing drugs are being used to treat a wide spectrum of psychiatric disorders, hypertensive vascular disease, and many other conditions. Although these compounds are quite different chemically and differ markedly in some of their effects, they all seem to share some properties in common, particularly an ability to produce a tranquilizing effect. Thus these drugs are reported to reduce motor activity, disturbed behavior, tension, and anxiety

Based on a statement by Morton Kramer, Sc.D., chief, Biometrics Branch, National Institute of Mental Health, Public Health Service, Bethesda, Md.

of drug studies in animals can furnish useful leads for human studies, and, as more information is collected, the "prognostic value" of animal studies may be increased.

An interesting example of an animal study is Eckhard Hess's study of the effects of meprobamate on "imprinting" in the newborn duckling. This work illustrates well the dangers in generalizing from one species to another.

The duckling in its first day of life forms an indelible permanent attachment to any moving object to which it is exposed. In nature this is, of course, its mother, but in the laboratory artificial but enduring attachments to specific humans, wooden images, or other "unnatural" stimuli can be produced. Meprobamate, in doses which apparently do not alter the duckling's behavior, can prevent it from forming an attachment to anything at all.

One could, by wild generalization, conclude that meprobamate should never be given to children lest it alienate them from their parents. This conclusion could be challenged on several counts. For one thing, "imprinting" in such a dramatic form has never been shown to occur in infants or young children. For another, it may well be that "anxiety" makes the duckling "imprint," and the meprobamate may merely reduce anxiety rather than specifically destroying filial love. However, such a finding provides a stimulus for rigorous drug testing in man. It also demonstrates that the value of a drug is related to its setting. In a patient nearing panic, it may be very necessary to reduce anxiety; in a student preparing for final examinations, some anxiety may be necessary to survival in school.

Almost all drugs with any real efficacy may produce side effects, or sensitivity reactions, even in therapeutic doses. Serious or lethal effects may occur from excessive doses of such relatively common pharmacological agents as aspirin, digitalis, or penicillin.

The Food and Drug Administration passes judgment on the release of drugs for prescription use and for sale to the public. To carry out this function, it makes sure that certain types and amounts of animal and human testing have been properly carried out so that one can be reasonably sure that the drug is safe

when used in accordance with instructions. As the law directs, FDA's major concern is with possible harm; it does not usually pry deeply into a drug's therapeutic efficacy, though this is taken into consideration.

Nonspecific and Behavioral Effects

The development and use of tranquilizing and related drugs for the treatment of psychiatric illness bring with them two types of possible harmful effects that cannot be entirely eliminated even by careful presale testing.

One kind of effects are those not specific to these drugs but encountered in some of them, that is, toxic or hypersensitivity reactions affecting the liver, bone marrow, or skin. I am told that no animal method exists which can insure that a drug will not harm these organs in man in a small percentage of cases. Unless early prerelease clinical trials of several thousand cases are insisted upon, no accurate evaluation of the possible incidence of such effects in man can be made.

The other type of toxicity, not peculiar to the tranquilizing drugs but highlighted by them, can be described by the phrase "behavioral toxicity," which is now often used to describe possible adverse actions of drugs on psychological functioning and behavior. This can be illustrated by the schizophrenic patient who, under a heavy dose of thorazine, sits drooling and comparatively immobile all day. He is not "disturbed," but many might doubt whether all the drug's effects are beneficial. At a less extreme level, it has often been suggested that patients treated with these drugs may show pathological lack of anxiety about red lights or family problems.

Unfortunately, such effects are both difficult to predict by animal experiment and difficult to detect in humans, at least at moderate dosages.

One may look for a psychiatric drug in at least two ways: One may synthesize chemical variants of a known drug that may, hopefully, be more potent or less toxic than the original. Or one may set up an animal test designed to detect a desired type of drug action and try out a variety of types of compounds looking for one with the desired effect.

stances, reductions—in age-specific first admission rates to State mental hospital systems. Much careful epidemiological and social science research is needed to explain such trends. Many facts are needed about “paths to the mental hospital” as well as “the barriers” hospital administrators place between the hospital and the community before one can determine what part the tranquilizing drugs may be playing in the reduction of admission rates.

Interpreting release rates from mental hospitals is a complex problem. Even prior to the advent of the tranquilizing drugs there had been striking increases in these rates. One must question whether increases in release rates over the years are due to (a) more intensive use of various psychiatric therapies, (b) differences in the kind of risk being admitted now as compared with years ago, (c) changes in attitude of staff toward level of improvement expected in patients prior to release, (d) administrative factors and staff and patient organization within the hospital, or (e) changes in the attitudes of the community and of the patient's family toward the mental hospital and the mentally ill.

The questions about the influence of the tranquilizing drugs on the outcome of hospital treatment emphasize quite sharply the need for clarification of what constitutes psychiatric treatment and as to what are the objectives of treatment within the hospital setting. If hypotheses with respect to the effectiveness of the tranquilizing drugs in accomplishing the goals of hospital treatment are to be tested, then it is essential that experiments and studies be devised that permit comparison of the effectiveness of a treatment method without use of the drugs with its effectiveness when the drugs are used.

Not only has the number of personnel in mental hospitals been inadequate in relation to the number of patients but the turnover of personnel has also been relatively high. The introduction of the tranquilizing agents has made possible the reduction or elimination of motor excitement in patients and of the associated need for seclusion and restraint in wards of mental hospitals. This changed milieu raises serious questions about how existing staffs will have to be retrained and how staff-

ing patterns should be changed, both as to character and numbers.

There is urgent need for carefully designed followup studies to determine the relationship of diagnosis, sex, age, length of hospitalization, therapy, and the socioenvironmental factors encountered by patients in the extrahospital world to relapse or successful readjustment. The use of the tranquilizing drugs suggests these further questions:

How should dosage levels used in the hospital be modified up to time of release?

When the patient is released, on what dosage, if any, should he be maintained?

What problems does the use of these drugs pose for the family?

What information should the family be given?

What resources in the community are needed to follow up these patients adequately to prevent serious complications from developing, to detect complications when they have developed, and to take appropriate steps to safeguard the patient, his family, and the community and to facilitate readjustment of the patient to the extrahospital world?

The preceding comments touch briefly on only a few of the problems the advent of the tranquilizing drugs poses to the public health profession. The participants in this roundtable discuss in greater detail some of the problems already mentioned and additional ones.

Development and Testing Of Psychiatric Drugs

brief

It would be highly desirable to be able to use animal tests to predict both the clinical efficiency of drugs and adverse reactions in man. Unfortunately, such animal tests cannot at present be relied upon. Nevertheless, the results

Based on a paper by Jonathan Cole, M.D., chief, Psychopharmacology Service Center, National Institute of Mental Health, Public Health Service, Bethesda, Md.

Even prescribed dosages may produce toxic effects after prolonged use. For patients who are seen only once every 2 or 3 weeks, there is ample time for a toxic reaction to become severe before it is detected by the physician.

For these reasons, extensive use of untried drugs with outpatients seems unwise. At Phipps, fewer than 10 percent of the patients receive any of the new tranquilizers.

Although the need for careful study of the effects of these drugs among outpatients is urgent, most outpatient clinics present formidable obstacles to controlled experiment. Such clinics usually are grossly understaffed. Many of the doctors may spend only a few hours a week in the clinic. Many patients see a different doctor on each clinic visit. The visits are apt to be so widely spaced and brief that patients cannot be adequately observed, and their records are apt to be sketchy.

Under the circumstances, there is no opportunity gradually to increase the dose to the point of maximum therapeutic benefit while holding it below the threshold of toxicity. This is especially important with certain tranquilizers because of the wide range of reactions among patients.

There is, moreover, no way of observing, much less of adequately controlling or appraising, what happens to patients during the periods when they are not seen in the clinic. In particular, there is no adequate way of controlling drug dosage. Some patients take less than the amount prescribed or take the drug only sporadically, without telling the doctor. Then the lack of therapeutic effect may be erroneously attributed to inadequacy of the drug.

Also, the usual outpatient population is diagnostically heterogeneous. Since many patients come to the clinic under direct or implied duress, they may not be cooperative, or their intellectual and educational level may be low, so that it is hard to obtain adequate reports from them. Many fail to return after one visit.

On the other hand, many psychiatric outpatient clinics have available a reservoir of chronic patients who come year after year, usually to obtain a sedative or to confirm that the clinic is still interested in them. Such patients may form a group on which long-term

as well as short-term effects of drugs can be tested. Those with personality disorders, ambulatory psychotics, alcoholics, and patients of low educational and intelligence levels, however, make poor subjects for drug studies.

Short-term studies of drugs in an outpatient setting are possible with the double-blind, own-control design. Long-term studies cannot be rigorous because of the difficulty of obtaining large enough experimental and matching control groups who will remain in contact with the clinic for a suitable period, but they should certainly be attempted. The important public health implications of the widespread use of inadequately tested drugs with outpatients places a special obligation on clinics to carry out evaluations.

Hospital Population Trend And Drug Therapy

brief In 1954 a series of pilot studies with chlorpromazine and reserpine were carried out in the New York State mental hospitals, and after a favorable experience with some 3,000 cases this method of treatment was applied on a wide scale. During the fiscal year April 1955-March 1956, more than 30,000 patients were given a course of chlorpromazine or reserpine. At the end of that period, the mental hospital population had been reduced by 452, in contrast to a gain of 2,421 for the previous year and to the average increase of about 2,000 per year for the decade before. The change was the most abrupt recorded, at least since 1909.

To assume that the sudden change in population trend was brought about even in part by the drugs is open to the usual objections

Based on a paper by H. Brill, M.D., assistant commissioner for the division of research and medical services, and R. E. Patton, M.P.H., director of statistical services, New York State Department of Mental Hygiene, Albany. A grant from the Albert and Mary Lasker Foundation permitted a more than routine analysis of the study data.

Current animal tests, however, are usually based on types of behavior which may bear only a superficial similarity to human mental illness. Animal counterparts of schizophrenia or depression seem particularly difficult to devise. Also, results with animals may differ from results with man. For example, one anti-tuberculosis drug, not effective in treating rabbit tuberculosis, was found almost by accident to be effective in human tuberculosis. A variant of morphine, N-allyl-morphine, has no analgesic properties in animals but does have them in man.

Following appropriate and careful animal screening to rule out acute and chronic toxic actions, the testing of the drugs for psychological effects in man becomes particularly necessary. Especially acute clinical observation and freedom from bias are needed to detect possible helpful effects, and sensitive psychological procedures must be devised to detect possible adverse effects.

Opportunities for Studying Inpatients and Outpatients

brief Psychiatric services of general hospitals and outpatient psychiatric clinics have one feature in common: They are usually under the same roof. In almost every other respect, they are at opposite extremes with regard to drug studies.

The psychiatric service of the general hospital permits intensive study of short-term effects of new drugs on inpatients. Close contact between patients and staff permits ready accumulation of extensive and reasonably accurate data about the effects of the drugs. Compared with mental hospital patients, general hospital patients can report more adequately on the drug's subjective effects.

Based on a paper by Jerome D. Frank, M.D., Henry Phipps Psychiatric Clinic, Johns Hopkins Hospital, Baltimore, Md.

There are, however, certain disadvantages of this setting. Among them are the short average stay (about 3 months) and the fact that many patients, those from distant points, are difficult to follow after discharge. Furthermore, because the patient population of the general hospital is usually both small and heterogeneous, it takes a long time to accumulate an adequate sample of a given kind. A more serious difficulty arises out of one of the virtues of the setting: The high staff-patient ratio, with intensive individualized treatment, makes it impractical to appraise effects of the drugs separately or to conduct a controlled experiment. Finally, since the improvement rate of the psychiatric service of most general hospitals is high even without the use of special drugs, there may be a tendency of experiments there to underestimate the value of these drugs in other settings where opportunities for intensive treatment are fewer.

Because of its favorable features, the psychiatric service of a general hospital has a special obligation to evaluate new drugs by using them judiciously under conditions as well controlled as possible, with aid from persons trained in research design such as clinical psychologists.

The possibility of using tranquilizing drugs to treat outpatients has public health implications that are both challenging and difficult. Since the mass of those who suffer emotional disturbances are not hospitalized, a drug which truly helps them would be a great boon. The beneficial effect of a drug, however, must be weighed against its toxicity and its cost. At present the new tranquilizers cost 10 to 15 times as much as the old standbys such as the barbiturates. Therefore, they would presumably have to be several times as effective to justify their general use, especially for a protracted span of time.

As to toxicity, without adequate supervision patients can easily overdose themselves. Toxic effects that are of no consequence in a hospital setting may be hazardous elsewhere. For example, Frederick Lemere has reported that drowsiness produced by self-administered overdoses of meprobamate was responsible for at least one automobile accident and for another patient's falling and injuring her shoulder.

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patients in these hospitals had increased each year.

Examination of a very large amount of statistics showed that in 1955-56 there was a small and somewhat variable degree of improvement in release rates for several diagnostic categories other than dementia praecox, and the increase of each in the hospitals was slower in 1955-56 than in 1954-55. We cannot rule out drug therapy as a factor in the improvement of the figures for nonschizophrenic patients since many of them received medication, but it is safer to assume that the small improvement in the alcoholic and senile-arteriosclerotic categories was due to the operation of some general factor and that this factor also probably accounted for a part of the improvement in the schizophrenic category. Most of the change, however, is clearly not a general one but is confined to certain special classes of patients. We believe, therefore, that a very large share of the improvement can be attributed to the drug program.

The effect of tranquilizing drugs on the need for forcible restraint was almost equal in importance. In October 1954, before chlorpromazine and reserpine were used in any significant number of cases, restraint or seclusion was being used for 23.2 per 1,000 patients. As drug therapy increased, the number diminished. By September 1956, the restraint-seclusion figure had dropped to 6.4 per 1,000, a 75 percent reduction.

Implications for the Future

If experience continues to confirm the observations outlined above, it seems that the use of these drugs will have a number of important implications with regard to the future of mental hospitals:

Diminishing emphasis will be placed on security functions and services for disturbed patients. Extensive and costly hydrotherapy installations appear to be outmoded since disturbed patients can be treated more effectively and in larger numbers with drugs, electric shock, and other forms of somatic therapy. The changed atmosphere of the wards has already been reflected in their furnishings. In the future it will be possible to pay more at-

tention to beauty and comfort and less to indestructibility. Layout of buildings will require less stress on continuous direct observation. (Closed circuit television will reinforce this tendency.)

Special arrangements for insulin shock and electric shock therapy still seem to be warranted.

Laboratory services will have to be enlarged to care for the increased work involved in supervision of treatment with potent pharmaceuticals.

Personnel of all types will have to be increased. The number of patients on somatic therapy in New York State hospitals is almost six times what it was early in 1954. This calls for an increase of physicians, nurses, and ward personnel partly for direct supervision of treatment but in even larger measure to supply the various types of psychotherapy and activity therapy for which many patients are now eligible. An expansion of the staff of occupational and recreational therapists will also be required. The reduction of work resulting from control of disturbed behavior is far more than offset by the increased need for other services.

A greatly expanded training program for all categories of personnel will be required.

As the therapeutic potential of the hospitals increases and as turnover of patients becomes more rapid, these institutions will be less a place of final disposition and more a part of a system of community health facilities. This will increase exchange of consultation and technical services with other community agencies and will require strong social service departments.

As turnover of patients becomes more rapid, quick methods of reporting and analyzing data will be needed to feed back information in time to guide current hospital operations.

Hospitals will require research units equipped and staffed to take part in the evaluation of new therapeutic agents.

The hospitals will have to replace working patients with paid help in kitchens, wards, and other hospital locations since the population of the mental hospital is coming to be made up of the fully disabled.

The immediate need for new hospital beds

Selected data on movement of patients in New York State mental hospitals

| Diagnostic category and year | Resident patients at start of year | Admissions | Deaths | Discharged from hospital | Placed on convalescent care | Returned from convalescent care | All other additions or removals | Resident patients at end of year | Gain or loss |
|--|------------------------------------|------------|--------|--------------------------|-----------------------------|---------------------------------|---------------------------------|----------------------------------|--------------|
| <i>All patients</i> | | | | | | | | | |
| 1954-55 ¹ | 90,893 | 21,459 | 8,078 | 3,093 | 11,269 | 3,968 | -566 | 93,314 | +2,421 |
| 1955-56 ² | 93,314 | 21,454 | 8,345 | 3,958 | 13,102 | 4,280 | -781 | 92,862 | -452 |
| <i>Dementia praecox</i> | | | | | | | | | |
| 1954-55 ¹ | 52,808 | 7,218 | 1,208 | 994 | 5,433 | 1,812 | -484 | 53,719 | +911 |
| 1955-56 ² | 53,719 | 6,787 | 1,192 | 1,176 | 6,687 | 2,038 | -602 | 52,887 | -832 |
| <i>Psychoses with cerebral arteriosclerosis and senile psychoses</i> | | | | | | | | | |
| 1954-55 ¹ | 13,995 | 6,714 | 5,463 | 161 | 809 | 272 | +14 | 14,562 | +567 |
| 1955-56 ² | 14,562 | 6,801 | 5,650 | 199 | 853 | 287 | +55 | 15,003 | +441 |
| <i>Alcoholic psychoses</i> | | | | | | | | | |
| 1954-55 ¹ | 3,486 | 1,423 | 201 | 410 | 1,046 | 469 | -33 | 3,688 | +202 |
| 1955-56 ² | 3,688 | 1,443 | 213 | 483 | 1,078 | 468 | -86 | 3,739 | +51 |
| <i>Involutional psychoses</i> | | | | | | | | | |
| 1954-55 ¹ | 4,126 | 1,603 | 227 | 182 | 1,248 | 364 | -31 | 4,405 | +279 |
| 1955-56 ² | 4,405 | 1,631 | 242 | 283 | 1,405 | 370 | -18 | 4,458 | +53 |

¹ Fiscal year April 1, 1954-March 31, 1955.

² Fiscal year April 1, 1955-March 31, 1956.

against post hoc reasoning, but we have as yet been unable to identify any other simultaneous change in conditions that could satisfactorily account for it. Comparing the figures for 1954-55 with those for 1955-56 (see table), we were able to establish several facts rather easily:

- There was no significant increase in deaths.
- There was no decrease in total admissions.
- There was no decisive change in the type of admissions. The number of schizophrenic admissions decreased, and there was some increase in senile and arteriosclerotic admissions, but these variations were not sufficient to explain the population change.

- There was a 23 percent increase in the number of patients returned to the community.

This increase accounted for most of the observed change in population trend.

Comparing the final population of 1954-55 with that of 1955-56 we found a small increase in the number of alcoholics remaining in the hospitals and a marked increase in the senile and arteriosclerotic group. On the other hand, schizophrenic patients decreased by 892, and among them the gain in releases was far greater among those hospitalized several years than among those newly admitted. While 431 fewer schizophrenic patients were admitted in 1955-56 than in 1954-55, the number released was 1,254 greater, much of the difference being drawn from the less recent admissions. For the previous 10 years, the number of schizophrenic, alcoholic, arteriosclerotic, and senile

record and also had some expectation that the nurse would continue therapy for patients.

The nurses' own feelings about mental illness were not always adequate. A small number of nurses are not emotionally constituted to accept this responsibility immediately. It takes time, experience, and counseling before such nurses feel secure enough to give supportive help to patients and their families.

Nurses did not readily understand their role. A nurse often conceives of her role as doing something with her hands or of doing something for the patient. She may need help to realize that in stress situations she may be most helpful as a listener. A clearer definition of the role of nurses, as well as that of social workers, would enhance efficiency of operation.

Many patients are being released on drug therapy without adequate followup services. Patients asked nurses these questions: "I have taken all of my pills. Should I take more?" "How can I get a prescription for my medicine?" On one home visit, the public health nurse advised a patient on tranquilizing drugs to go to his family doctor to get his medicine. The doctor had to learn from the patient the name and the dosage of the drug he was taking before he could write the prescription. When a patient is discharged or sent home on trial visit, a letter of prescribed medication should go to his family doctor and a copy should be sent to the health department. Unfortunately, some of these patients do not have a private physician. Who should assume medical supervision of these patients?

Outpatient clinics or mental health clinics, with psychiatrists to staff them, would provide patients with a check on their progress and continuing supervision. The hospital is usually too far away for a discharged patient to travel for examination and advice, and the patient on tranquilizing drugs may be without adequate medical supervision at home. Physicians in the community often express a need for consultant services of a psychiatrist in regard to care of discharged patients. We are trying to establish such clinic services now in Kentucky.

Public health nurses feel that patients are not well enough informed about the importance

of continuing drug therapy until the psychiatrist says it is no longer needed. A patient at home feeling better may quit the drug, with the result that he experiences a relapse and must return to the hospital for further treatment.

Tranquilizing drugs also present a financial problem for patients and their families. Many patients stop taking the drugs because they do not have the money to buy them.

Nurses participating in the pilot study were given lectures on the two drugs which were being widely used at that time and were told of complications or reactions which might occur. They were prepared to recognize and report untoward symptoms to the patient's doctor. However, the nurses feel that they have not been adequately informed about drugs more recently introduced.

We found that the nurse could be helpful to other professions in obtaining histories and information about family situations related to a patient's illness. But we are sure that this was not her most important contribution to this program, nor the best use of her professional skills, nor a role that would have the most far-reaching effects. We are convinced that the public health nurse's service in helping the family understand the patient, his illness and his needs, will lead to community support of local facilities for reduction of mental illness.

Use of Tranquilizers In a State Program

brief In 1955, when tranquilizing drugs were coming into wide usage in general practice, the Maryland State Department of Health, on recommendation of its Council on Medical Care, decided to allow payment for the drugs under Maryland's medical care program. By January 1956, their

Based on a paper by V. L. Ellicott, M.D., Dr.P.H., chief, bureau of medical services and hospitals, Maryland State Department of Health, Baltimore.

has not decreased. Viewed in the perspective of this need, success with drug therapy appears almost trifling since the hospitals are still overcrowded and obsolescence of facilities is serious.

Supportive Services For Patients at Home

brief Although we have had limited experience in Kentucky in giving public health nursing services to patients on tranquilizing drugs, we have established the groundwork for such services in a pilot area in the western part of the State. The emphasis in this project has been to give supportive help to families of hospitalized mental patients. We started with the assumption that if the family and the community were to play a role in rehabilitation of the mentally ill, they, particularly the family, must participate in his treatment. When the patient returns home for trial visits, the family must accept his illness and have some understanding of his experiences in the hospital.

The Kentucky pilot project was carried out in three counties in western Kentucky—Marshall, McCracken, and Daviess—served by Western State Mental Hospital.

Before the project was initiated, a week of inservice training for public health nurses was given at Western State Mental Hospital, with lectures by the professional staff, films, discussions, ward observation, and visits with the patients. A referral system was agreed upon whereby the hospital social service department would notify the public health nurse when a patient from her county was admitted for the first time. The hospital referral form included the date of admission, directions for reaching the patient's home, the relative to be contacted,

Based on a paper by Mildred Kingcade, R.N., M.P.H., mental health nurse consultant, division of community services, Kentucky State Department of Mental Health, Louisville.

tentative diagnosis, and information relative to development of the patient's illness.

During the first 13 months of the project, 94 patients were referred to the 10 nurses in the 3 counties. The public health nurse visited the home of each patient, and findings of her visit were reported to the hospital medical staff. A more complete report was sent to her when the patient was discharged or sent home on trial visit. This report included diagnosis, prognosis, course of treatment in the hospital, and recommendations to the public health nurse by the hospital psychiatrist, nurses, and social worker.

The nurses' visits to the patients' families have proved to be valuable in many ways. Seeing families of the mentally ill has helped the nurse to offer comprehensive services for the entire family. Visits to the home have enabled her to interpret the patient's illness, the need for hospitalization, admittance procedures, and hospital policies. Her talks with the family have helped to allay their expressed fears and anxieties and have helped the family accept the patient's illness and the patient himself when he returned home. The nurse also has made essential referrals to community resources and has helped patients understand how to use rehabilitation services.

The counties in this pilot study have had only 1 public health nurse to every 15,000 people. Yet these nurses have demonstrated that their experience in the public health field, their knowledge of illness, and their skill in human relations have been most beneficial to mental patients and their families.

Toward Improved Services

The following problems, which arose in this study, point the way toward improved supportive services for mental patients and their families.

There was uncertainty among hospital personnel and public health personnel as to objectives. Public health aims were to help the family accept the patient's illness and to prepare them for their role in his treatment, trial visits, discharge, and rehabilitation. The hospital personnel expected the public health nurse to contribute to diagnosis by keeping a detailed

cipally hypertension. Nine said that patients with anxiety or nervous tension derived benefit. Six volunteered the information that elderly patients were improved, three mentioning those with emotional conditions and two those with hypertension. Four physicians cited benefit in painful or terminal conditions, and one mentioned value to patients "requiring mild sedation and sensitive to barbiturates." This physician also said that he had an elderly patient with bronchiectasis who was more relaxed and had less gastrointestinal upset when on chlorpromazine. One advocated tranquilizers for "mild depressions, tension, and anxiety"; another, for "the mild hypochondriac type with many general but no specific complaints"; and another, for "neurotics." A few physicians considered the principal value of tranquilizers to be general with respect to the patient's morale, but most considered that this was secondary to their value for specific conditions.

The physicians were asked to "comment on the possible value of tranquilizing drugs in enabling some of the medical care patients to remain at home who might otherwise require care in a mental hospital." Eleven either stated that they had no such patients or declined or failed to comment on this question. Five, however, stated that they were treating one or more patients at home who would otherwise require institutional care.

One physician who serves part time as clinician in a mental hygiene clinic stated that the clinic was treating 15 parolees of one of the State's mental hospitals. He said, "There is no question that half of these patients would have to be back in the State hospital without the use of these drugs." Eight other physicians, although not citing any cases, said they considered the drugs valuable in this respect. One said that he had had no experience with "wellfare cases" on tranquilizing drugs but had "two cases of schizophrenia as private patients doing well on rauwolfia." While these replies indicate that a considerable number of mental patients are on a regimen of these drugs at home, the information is insufficient to estimate how many of them would otherwise require care in a mental hospital.

Summary Remarks

brief

What about the effects of tranquilizing drugs on hospitalized patients? It seems there is little doubt that their use reduces in quantity, and maybe even in quality, the responses which individuals make to psychotic processes. This has led to changes in the management of hospital programs in that hospital staffs are more oriented to a "total-push" type of treatment. The drugs may well affect the course of hospitalization in that there seems to be some evidence that a small percentage of people develop adverse reactions to the medication. Patients seem to leave the hospital sooner, but there may be other causes for the decrease of length of stay in the hospital. We need to ask ourselves, "Have there been changes in admission policies? Have there been changes in treatment methods? Have there been changes in the criteria with which a patient is evaluated before discharge?"

For a number of years we have heard about patients being lost in mental hospitals. One might ask the question, will these same people tend to get lost in communities? If so, what will it mean not only to these individuals but to the communities as well? We might well wonder about the implication that patients on drug therapy are now regarded as being ready to leave when they are at a stage that was not considered satisfactory before the introduction of the tranquilizing drugs.

As to patients who are not hospitalized, we have heard that there were 35 million prescriptions during the last year for tranquilizing drugs in the United States. In the Maryland medical care program, the tranquilizing drugs amounted to 11 percent of the total drug bill in one period. Many of the patients no longer in hospitals are being seen only by public health nurses if at all. Many of the nonpsychiatric outpatients on drug therapy are children.

Based on remarks by Roger Howell, M.D., formerly professor of mental health, University of North Carolina School of Public Health, Chapel Hill; now with the LaFayette Clinic, Detroit, Mich.

usage and cost had become a serious additional expense.

A typical medical care prescription for a tranquilizing drug would be 50 to 100 tablets. Directions would usually call for 3 tablets per day, so the prescription would last 3 to 5 weeks. It would cost the State \$3.50 to \$4.00.

By far the most frequent diagnosis of these patients is hypertension or hypertension with one or more other conditions. Most are over 45 years old, and the ages run somewhat higher than those of other medical care patients. Seventy percent are women.

Bills for tranquilizing drugs are costing the medical care program an average of \$3,000 a month, 11 percent of the total drug cost. The program's drug bills for June 1956 contained 950 tranquilizing drug prescriptions written for 665 patients by 253 physicians, approximately one-third of the physicians participating in the program at the time.

While the cost of prescriptions for tranquilizing drugs seems to be leveling off, monthly variations leave an uncertainty as to whether an increase in usage is still going on. There does not appear to be any simple means of reducing the cost of these drugs.

Study of Selected Records

A detailed study was made of the records of 30 physicians who prescribed tranquilizing drugs for at least 5 patients during the June payroll (approximately June 1956). These constituted about one-eighth of those who prescribed tranquilizing drugs, but the 264 prescriptions written by them were one-third of the total. They cost the program \$967. Ten of the physicians practice in a fairly large industrial county in the western part of the State. The cost of the prescriptions written by them totaled \$445. High drug prescribing, for both the medical care program and private patients, has long been a characteristic of this part of Maryland.

Two-thirds of the prescriptions of these 30 physicians called for some derivative of rauwolfia. Eleven different forms were prescribed. The remaining third were about equally divided between the chlorpromazine group and meprobamate. When matched

Source of Data

Maryland's medical care program was begun in 1945 and is operated by the Maryland State Department of Health and the full-time health units which function in each of the State's 23 counties. In Baltimore City a separate program is administered by the Baltimore City Health Department. The data presented are taken from the program of the counties, which offers medical services to approximately 20,000 indigent and 6,000 medically indigent persons. It pays for physicians' home and office calls, dental, laboratory, consultation, and diagnostic services, and drugs.

When a physician wishes to prescribe a drug for a medical care patient, he fills out a medical care prescription blank and gives it to the patient. The patient takes it to a pharmacy, where it is filled without charge. The pharmacist sends a copy of the filled prescription to the State health department. This constitutes his bill, and he is reimbursed for it according to its wholesale cost plus an allowed markup charge and container cost.

against diagnoses, the drug most commonly used for hypertension was rauwolfia. Chlorpromazine and rauwolfia were used in about equal extent for neuropsychiatric diagnoses. Meprobamates were prescribed for 2 psychoneurotics and 1 psychosomatic patient.

A questionnaire was sent to each of these 30 physicians. Replies were received from 28. Since all were selected as heavy prescribers, they were assumed to be biased in favor of the drugs. They were asked, therefore, not whether the drugs were considered to be useful but for which types of medical care patients they had been found to be of most value.

Only one volunteered the information that he had "not been sold on tranquilizers." This man referred to the drugs as "overadvertised." One referred to his experience with meprobamate as "not significantly superior to phenobarbital."

Harmful side effects were mentioned by only one physician. Referring to chlorpromazine given to the elderly patient, he said that "continued use seems to cause mental degeneration."

The majority stated that the drugs were of most value in treating specific conditions, prin-

As for the community as a whole, or that jurisdictional entity known as the body politic, one of its most important units is the family. What is the use of tranquilizing drugs going to do to the family? Will there be more families with "sick" members? These may be less sick than before but still sick enough to make demands upon the family. We can see, then, a great need for educating families who must support such patients. How may family crises change as a result of the drugs? If the usual leader goes on the drugs, he is less apt to respond with an emotional charge to a challenge. What may be the effects of changes in family interaction and competition, particularly upon children? Apart from the financial costs of the drugs, what is going to be the emotional cost inflicted by the presence of a still moderately sick person in this family? What does this do to the usual identification processes which go on in families? Will a child be more or less likely to identify with an individual who ordinarily adapts to life in a sick pattern?

Similar community issues arise in industry

and business. Should day laborers and manual laborers be on tranquilizing drugs? Should people in a position to make important decisions be given the drugs? What is going to happen to group morale if a fairly large number of the group take tranquilizing drugs?

What does it mean that such a large percentage of our population has found it desirable to use tranquilizing drugs? What kind of times are we living in, anyway? Have we become afraid of "anxiety"? Does this mean that we are developing into the kind of people who shun responsibility? What kind of health problems will we then encounter in the future? Is there such a thing as "tranquilizism," comparable to alcoholism, and if so, what is this going to mean?

In conclusion, there has been much information which has indicated that the drugs do have a beneficial effect on some patients, but we need to learn a great deal more about how the drugs are to be used safely and effectively. It seems certain that with continued effort we will learn to use these drugs in an appropriate fashion.

Minimum Daily Requirements for Two B Vitamins

Minimum daily requirements for niacin have been fixed for the first time by the Food and Drug Administration. The regulation, published in June 1957, also lowers the adult minimum daily requirement for riboflavin. In order to allow producers to comply with labeling requirements, the order is to become effective July 1, 1958.

When minimum daily requirements were first set up for vitamins in 1941, clinical evidence of the niacin requirement was insufficient to fix the minimum needs for the vitamin. Studies since then have led to the establishment of the minimum requirements at 2.5 mg. for infants, 5 mg. for children under 6 years, 7.5 mg. for children of 6 or more years, and 10 mg. for adults.

The revised adult requirement for riboflavin has been changed to a minimum of 1.2 mg. daily from 2 mg., which had been based on limited evidence in the cure of ariboflavinosis.

The difficulties in keeping outpatients under the proper dosage raise the question of whether or not there should be a great deal of difference between dosage for hospital patients and dosage for nonhospitalized patients. This is related to the difficulty of evaluating the toxic effects. Reaction patterns, from the bone marrow out to the skin, resemble to some extent another famous "great simulator." The difficulties of research are complicated by the many questions concerning behavioral symptoms, as is true also of the use of alcohol or bromides. The great question concerning nonhospitalized patients is where these people get their supervision. Also, what kind of training programs should be developed so that supervisors may understand the nature of the drugs and the possible complications?

What happens to people who use the drugs who are not ordinarily thought of as being psychiatric patients? Are there potential psychiatric patients who are never brought to the psychiatrist as the result of use of the drugs? If this be so, is this a desirable or undesirable effect? We do not know all that the drug itself may do to them. It is impossible to estimate the number of persons in the United States today who are living in a state of imposed tranquility. We do not know as yet whether there is an addiction to the drug, and certainly we do not know whether persons using these drugs should be employed in industry or whether they should be driving a car or even going to school. There is apparently a great deal that we do not know about the effects of the drugs on normal persons, using the word normal in the ordinarily accepted sense. What do they do to human relationships? Also, what are the effects of these drugs on people who already have organic brain disease?

Under the heading of effects on health personnel comes the question of hospital staff. The suggestion that more personnel will be needed to carry on treatment of patients on ataractic drugs seems true for all hospitals. What kind of training are we going to offer to prepare employees for new programs? What are going to be the differences in the budgets for mental hospitals? Even in the general hospital, where there may be increases in psychiatric beds, there will be need for a different hospital

budget and new training for doctors, nurses, and administrators as more patients are treated with tranquilizing drugs. Similar thoughts apply to outpatient clinics and private practice.

One interesting sidelight on community needs for health personnel is that public health nurses and others may well need to have a resource for advice on helping people who are on tranquilizing drugs. What kinds of cooperative programs are going to be developed to assist in the followup care of patients who have been discharged from the hospital or are under supervision from an outpatient clinic? What does this mean to the family service agency, to the police, and to the courts?

It has been suggested that a manual might be given to people who are using tranquilizing drugs. One pharmaceutical company has produced such manuals and has distributed them to mental hospitals to be given to patients when they are discharged.

On the subject of facilities, what physical changes are likely in mental hospitals? Can we almost completely do away with seclusion and confinement areas and build different therapeutic units? There seems to be an indication that we will need more units to stimulate a return to the nonhospitalized society. Certainly, extended social service units in hospitals should work out cooperative programs with existing facilities close to the past or potential patient.

In general hospitals, we will need a great deal more occupational and recreational therapy and training programs for personnel in these units, along with social service departments in the hospital and laboratory facilities related to the drugs. There will be an increased need for outpatient facilities for psychiatric patients and for both professional and popular education.

The health department may see the drugs as another aspect of the effects of nutrition upon the public's mental health. Will health departments seek to know the number of people in the community who are using tranquilizers? Obviously, the health department will have greater need than ever before to affiliate itself very closely with rehabilitation units in hospitals and other agencies in the community.

pharmacology Service Center as a focus of information and communication. Roy R. Grinker was chairman of the Committee of Editors.

The productive efforts of the committees deserve the commendation of the workers in this field. The committees have attempted to analyze a host of significant variables that are related differentially to any single study on any specific drug on any sample population. They have developed an outline of the factors that any research worker must consider when reporting drug evaluation studies. Clearly, however, the committees have set forth guidelines,

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Committee on Patient Selection and Description

Harry Freeman, chairman

The committee focused its discussion and recommendations along the lines that seemed most likely to achieve the following two purposes: (a) that the reader of a report be adequately informed concerning patient selection and description in a given study and (b) that the results of smaller studies might conceivably be pooled for statistical analysis. The first purpose is probably an obvious one, but at this stage of research in drug evaluation it may be useful to spell out in some detail the kinds of information that should be included, or at least considered for inclusion, in all reports.

Factual Information

In order to achieve some comparability in research reporting, the following might be given in descriptions of patients:

Age. It appears that there may be some relation between age and responsivity to drugs.

Sex. Response to drug therapy might vary with sex, and it is therefore desirable to record it.

Ethnic origins. Cultural or genetic patterns

not standards of excellence, in their recommendations.

It is our hope that the committees' recommendations will prove useful and meaningful to the wide variety of technical personnel interested in drug evaluation studies and their outcome. In many instances there are direct implications to the nature of experimental designs employed. It is not intended, however, that the nature of such studies be prescribed or standardized. The purpose of the conference was to consider the reports of investigations. In this purpose we hope the conference has been successful.

might show differences in type or severity of psychosis and in response to drugs.

Religion. This factor should be recorded as an ethnic element because of its possible influence.

Intelligence. This factor should be noted, ideally by a precise psychological evaluation, but at least by clinical impression of the investigator.

Education. The last year of schooling is the most practical measure that can be used.

Socioeconomic factors. The last usual occupation and the average yearly income of the patient or of the household should be listed.

Community from which patient is drawn. Information on the type of community (urban or rural) and its general economic level might be included.

Marital status. A simple statement of marital status is suggested.

Premorbid personality. Information can usually be obtained only from the family and is often inadequate, but, if possible, it might be recorded. The type of personality (inadequate or schizoid, for example) and the degree of stability of the personality and any anti-social trends should be noted.

Family history. Information is ordinarily



Recommendations for Reporting Studies of Psychiatric Drugs

LEADING clinical investigators and editors of scientific journals conferred in Washington, D. C., January 14-15, 1957, on questions in the reporting of psychiatric drug studies. The conference was arranged by the recently established Psychopharmacology Service Center of the National Institute of Mental Health, Public Health Service, in collaboration with the American Psychiatric Association.

Several specific conditions in the field of psychopharmacology prompted the calling of this conference. Among these were (a) the great and expanding mass of literature dealing with clinical evaluation of drugs, (b) inadequacies of published papers, particularly with reference to details of pertinent information, (c) present pressures and anticipated pressures for space in existing journals, and (d) need for rapid presentation and exchange of information in order to provide for optimal development of techniques and utilization of research findings.

The major purpose of the conference was to consider ways in which reports of clinical evaluation studies of psychiatric drugs might be made more informative and more useful. The objective was not merely to develop recommendations on how more information might be provided, but rather to consider what kinds of information might help make reports more relevant, more meaningful, and more conducive to improved research efforts. It was not within the scope of the conference to set down details of methodological standardization. The mission was to improve communication in the published literature.

A number of clinical psychiatrists, together with representatives of other pertinent areas (psychology, pharmacology, and internal medicine), were invited to participate. A group of scientific journal editors were also invited to examine the impact of research in psychopharmacology on their publications and consider the implications for the scientific and medical literature of the major effort now under way. Nathan S. Kline represented the American Psychiatric Association.

Each participant served as a member of 1 of 5 committees: Patient Selection and Description, Evaluation of Change, Description of the Treatment Setting, Drug Therapy and Toxicity Reactions, and Editors. The work of these committees constitutes an unusually detailed analysis and delineation of the problems of adequate reporting of clinical drug evaluation studies. Proper focusing and selection in relation to the particular problem under study must remain the decision of the individual investigator.

The reports of four of the committees, with only slight editorial changes, are presented below. The report of the fifth, the Committee of Editors, dealt with a wide variety of problems related to psychopharmacology. Specifically, this committee was concerned with the quality of many papers submitted for publication, the peak point that will be reached in the number of articles dealing with psychopharmacological research, the need for immediate publication of many papers, the usefulness of a new publication, and the role of the Psycho-

include clinical screening by means of psychiatric evaluation.

Although the ultimate goal of any therapy should be the restitution of the "well" state, limited goals may be the only ones practical. These goals should be clearly specified in the report. They could include such changes as control of undesirable behavior, elimination or alleviation of subjective discomfort, better hospital adjustment, and so on. It should also be recognized that the permanence of the symptomatic effect may have nothing to do with the effect of the drug as such. A result can be reported as excellent, for example, if the patient responds initially to the drug but later relapses.

It is highly desirable to define the criteria for improvement or change and also to state clearly the method used to measure and evaluate such change. The degree of change of the target symptoms must be measured and described in the areas of motor behavior, social functioning, mentation, and mood and affect. It is important to define clearly the specific variables that were measured. Any disturbances that are reportable and that can be considered the target symptoms should be categorized by these symptoms and clearly described. Diagnostic terms or special terminologies peculiar to certain schools of thought or to certain hypothetical preconceptions as to how drugs act do not belong in the description of the target symptoms. It is necessary that all data from which conclusions are drawn be clearly and specifically documented. If certain diagnostic categories alone are used, one might not be able to distinguish, for example, between a retarded and an agitated depression or between an aggressive and a withdrawn catatonic schizophrenic patient.

For proper reporting of evaluation of changes, it is necessary to have a stable baseline study on each patient. Because of the well-known day-to-day variations in symptomatology shown by patients, multiple baseline observations should be reported. These, along with all other observations, should include, whenever feasible, not only systematic observations by the physician, but also evaluations by the patient himself, by ward personnel, and, if possible, by the family of the patient and

others. These observations and evaluations may be difficult or impossible to make, of course, when acutely ill hospitalized patients or outpatients are being studied.

A study should include a series of observations made at appropriate intervals. The report should specify the time intervals of these observations, in addition to the times at which the pretreatment and post-treatment observations were made.

The report should describe clearly the actual training of personnel (aides, nurses, physicians, psychologists, social workers, and others) in the specific techniques used in the study. For example, the report could tell the amount of instruction given concerning the definitions used in a rating scale and the number of trial runs before actual use of the scale.

Whenever possible, several techniques should be combined and used as a battery because at the present time no technique has been accepted as being sufficiently reliable to stand by itself. When rating scales are used, the test-retest reliability and the interrater reliability should be reported.

The reports should include not only a description of the measuring instruments used, but also the manner in which they were used. One of the following statements might be made: "Assessments of mental condition of the patient were made on the basis of clinical interviews of 30 minutes' average duration conducted by a third-year psychiatric resident." "Assessments of hospital adjustment were made by attendants. Three attendants from the patients' ward, working as a group, rated each patient on the hospital adjustment scale, basing their rating on the behavior exhibited by the patient during the preceding 2-week period." "Assessments of social and recreational adjustment were made from the reports of the chief recreational therapist, who reported on each patient every 2 weeks."

Psychosocial factors which are nonspecific to the drug but which are operative in the process of the psychiatric remission are important and cannot be ignored. Two errors are commonly made in regard to these factors. One is continuously to rediscover and report their operation when in fact they have been recognized in the literature for years. The committee

limited, but incidence of mental illness in the immediate family could be determined.

Duration of illness. Data are usually inadequate, but some differentiation can be made on the basis of whether the illness is relatively recent or long standing.

Onset of illness. The onset characteristics (sudden or gradual) should be given.

Duration of hospitalization or treatment. A statement of the history of previous hospitalization or of psychiatric treatment should be made.

Description of present mental illness. The following items should be included: psychiatric diagnosis, description of motor activity, degree of socialization, mood disturbances, disturbances in ideational content.

Complications of preexisting organic disease. Although the committee feels that usually these conditions do not affect the therapeutic result, it is suggested that they be noted in view of the possible side effects of the drugs.

Previous treatment. The type of treatment, its intensity, its therapeutic result, and the interval since its discontinuance should be reported.

Physiological data. Where relevant, estimates of physiological functioning should be made prior to therapy. Simple evaluations of body type, height, weight, electroencephalograms, biochemical data, and autonomic responsiveness as measured, for example, by the Funkenstein test might be included.

Diagnostic Categories

The committee believes that the tranquilizing drugs will probably be tried in all the diagnostic categories of psychiatric disturbance. Although the American Psychiatric Association system of diagnostic classification has certain inadequacies, it is probably the best nomenclature now available. It might be used to describe the patients in a study.

Other Relevant Variables

Criteria for selection. The method by which patients are selected for study, whether on a random basis, by psychiatric symptomatology, or by diagnosis, should be explicitly described. The desirability of selecting controls by some

explicit method was discussed, and such selection was recommended by the majority of the committee.

Patient population. The total number of patients in the hospital and the number of patients of similar diagnostic grouping available for treatment, with some notation as to age and duration of hospitalization, should be mentioned.

Description of professional personnel. For proper evaluation of the observations, it would be desirable to state who selected the subjects for study; for example, senior psychiatrist, psychologist, resident, nurse, or attendant.

Pilot studies. When pilot or exploratory studies are made, these should be described.

We recognize that accumulation of all these data represents an ideal which can be more easily accomplished in studies on small groups than on large ones. Nevertheless, the reporting of information suggested should be the aim. Such data could be easily tabulated on machine punched cards.

Committee on Evaluation of Change

Ivan F. Bennett, chairman

Although changes in individual symptoms do not necessarily imply a change in the basic processes of the mental illness itself, the action of a drug seems to be best described and measured in terms of its effects on specific symptoms. Since drug therapy is aimed at modifying these symptoms, they can be referred to as "target symptoms." The degree of accuracy in reporting changes will depend on how well these target symptoms are defined and described. Quantitative changes in severity and frequency should be considered. There should be a clear distinction between patients in whom there is a change in all target symptoms toward recovery and those in whom there is only a partial change in some or all of them.

Inasmuch as all symptoms are interrelated, the committee believes that the clinician should be the principal interpreter of the whole configuration of symptom changes. Studies pertaining to therapeutic efficacy should therefore

was carried out if that was not the entire hospital. These modifications apply to all items that follow.

We appreciate that the list we offer is not complete or final. Further experience will probably indicate the need for additions, deletions, or modifications.

Structure of the hospital

1. Size of hospital and of research unit; percentage by which average daily population varies from "normal" bed capacity.

2. Location of hospital; accessibility to visitors.

3. Type of hospital: Federal, State, city, county, or private; general or specialized psychiatric.

4. Architectural characteristics; for example, cottage type or skyscraper.

5. Physical characteristics of wards and furnishings: type of furniture, presence of color, and decorations; accessibility of wards to grounds; number of beds per room or dormitory.

6. Per diem expenditure of hospital for total care of patients.

7. Quality and nature of relationships of hospital with community; extent and nature of participation by relatives in hospital program.

Personnel of the hospital

1. Various types of personnel, expressed both as numbers and as percentages of the numbers called for by American Psychiatric Association standards in the several major categories.

2. Predominant therapeutic orientation of psychiatric staff: eclectic, psychoanalytic, custodial care, somatic therapy, or other.

3. Description of major related therapy activities, such as social service, occupational therapy, and clinical psychology.

4. Training programs of hospital, including both identification of such programs and number of trainees in each.

5. Amount of freedom of action granted to nursing and other personnel, and the conditions thereof.

6. Rate of personnel turnover.

7. Social characteristics of ward personnel:

drawn from farmer population, from urban population, or from displaced industrial workers, for example.

8. Research orientation of hospital: kinds of research and quantitative measure of hospital resources devoted to the total research program; person or persons responsible for administration of research unit; existence of a research committee.

Patient population

1. Special characteristics of the patients in the hospital: Are admissions "screened" through a psychiatric section of a general hospital? Are certain types of patients (for example, alcoholic or senile patients) excluded? Are patients segregated by color, sex, or religion? What is the socioeconomic status of the patients?

2. Percentage of voluntary admissions.

3. Percentage of privileged patients.

4. Amount of seclusion, restraint, destructiveness, assaults, injuries, incontinence, and the like; elopements and action taken; kinds and amounts of sedatives used.

Committee on Drug Therapy and Toxicity Reactions

Heinz Lehmann, chairman

In the clinical evaluation of psychiatric drugs many of the problems encountered are common to all types of drug therapy. With the rapidly increasing number of drug agents and of clinical reports in psychiatric therapy, new and specific problems have arisen.

We have found it difficult to dissociate completely our considerations from those of the other committees. We have, however, attempted to limit the scope of our discussions to (a) routes and modes of drug administration, (b) problems concerned with dosage and duration of treatment, and (c) drug-induced deviations from the physiological and psychological norms (complications, toxicity reactions, side effects).

It is outside the scope of this report to consider the basic conditions for experimental

realizes, however, that most research workers doing drug studies have not paid much attention to psychosocial factors. The other error is to overestimate the importance of psychosocial factors. When the outcome of drug administration on target symptoms is marked, psychosocial factors may play a secondary role. Nevertheless, the appropriate recognition of these factors is essential in the evaluation of changes due to the drugs.

For full understanding of the nature of the change in the patient, the characteristic pharmacological effects of the drugs must be determined by clinical or laboratory procedures, or both. When appropriate, these effects should be reported. Nonpsychological effects, such as sleepiness, Parkinsonian symptoms, or diarrhea, may have a significant bearing on the behavioral or psychopathological features that were measured, and they should therefore be noted in the report. Other pharmacological indicators that may be relevant to such problems as adequacy of dosage should be included if available.

Finally, a research design gains in value if there is a person on the research team who evaluates the patient but who is not a member of the treatment team. Similarly, a research design is improved if the individual who collates the multiple individual observations is not himself a member of the treatment team.

A description of these research team variables is therefore useful in a drug evaluation report.

Committee on Description of the Treatment Setting

Jay L. Hoffman, chairman

Patient behavior is a response not only to the drug which is administered, but also to the total milieu in which the experimental design is established and the experiment carried out. Therefore, the committee believes that descriptive data relative to the setting is essential to appraisal of psychopharmacological research and its validity by the reader.

We have listed a number of items that in the

aggregate serve to describe the setting in which drug evaluation studies are conducted. We do not expect that the investigator will slavishly adhere to this list. Rather, we hope that he will select those items that are most closely applicable to the circumstances in which his study was carried out, or which can be described within the space he is willing to allot to this phase of his report.

In selecting these items we restricted ourselves to types of data which could be expected to be available to most investigators without onerous or expensive effort. Our inclusion of the listed items does not necessarily signify that they have proved relevance to those factors that are significant in the evaluation of a therapeutic agent. Admittedly, we are here expressing personal biases, but these biases are shared by many of our colleagues. We hope that recording these items in a succession of studies will stimulate the further investigation of the value and meaning of these factors per se.

It has been pointed out that consideration of any large number of items will take more space than most editors will permit. We are not certain that this is so if the items are chosen with some discrimination and if the writer has learned the art of brevity. At any rate, such descriptions need to be repeated in subsequent papers from the same hospital only to the extent of significant changes in the setting.

It is of some importance to emphasize that the report writer should be concerned not only with a description of the setting as it was at the beginning of the study, but also with any alterations in the setting introduced by the investigator or by circumstances after the study was begun.

We have categorized about 20 items under 3 headings. Initially, we had a fourth category, attitudes. We soon found that almost every item we considered reflected attitudes of staff, administration, patients, or community. We would expect, however, that attitudes as such of both staff and patient would be mentioned when such data are available to the investigator. We also found that with most items we were concerned not only with a description of that item for the hospital as a whole, but also for the unit in which the study

and rationale should be provided since such drugs themselves might be responsible for additional side effects or otherwise interfere with the therapeutic response. It must be emphasized that absence of moderate side effects during treatment with a drug should not be considered too strongly in favor of its clinical desirability.

Medical participation is fundamentally important for the conduct of clinical evaluation of drugs, particularly with regard to

the clinical assessment of the physiological deviations.

Finally, the committee strongly recommends that in reports of evaluation studies of drugs, extrapolations beyond the observed results; particularly with regard to dosage, range, duration of treatment, and significance of side effects, should be scrupulously avoided. All members agree that ex cathedra editorializing or moralizing would at this stage impede future scientific progress.

Advisory Committee on Community Air Pollution

A National Advisory Committee on Community Air Pollution has been set up by the Public Health Service. The first meeting was held June 17, 1957, in Washington, D. C. The committee was established to review the objectives, policies, and accomplishments of the program established by the Service under a 1955 act of Congress and to make recommendations to the Surgeon General.

In recognition of the primary responsibilities of the States and local governments in controlling air pollution, the Service's basic program has been one of research and technical assistance to areas coping with this problem.

Membership on the committee includes Surgeon General Leroy E. Burney as chairman, and 12 members representing State and local air pollution control agencies, universities, industry, professional associations, and private consulting firms in the field. Ten persons have already accepted membership on the committee; the other two will be named shortly. The 10 are Dr. James P. Dixon, health commissioner of Philadelphia, Pa.; Peter N. Gammelgard, vice president of the Pure Oil Company, Chicago, Ill.; Smith Griswold, director of the Los Angeles County Air Pollution Control District; Benjamin Linsky, air pollution control officer, Bay Area Air Pollution Control District, San Francisco, Calif.; Edward C. Legelin, vice president of the U. S. Steel Co., Chicago, Ill.; Dr. Louis C. McCabe, president of Resources Research, Inc., Washington, D. C.; Dr. Malcolm H. Merrill, director, California State Department of Health, Berkeley; Dr. Norton Nelson, associate professor of industrial medicine, New York University; Dr. Leslie Silverman, Harvard University School of Public Health, Cambridge, Mass.; Dr. Irving R. Tabershaw, associate professor of occupational medicine, Columbia University, New York City.

evaluation of the drug. We agree unanimously, however, that prior to the initiation of clinical trials, adequate pharmacological and toxicological animal data should be made fully available to the clinical investigator. All studies on drugs with only animal toxicological and pharmacological data available prior to clinical tests should be supplemented with adequate equivalent human data obtained before or during the clinical study. Such data should be reported completely and in detail, although not necessarily in the same report. To this end, means might be found to arrange for closer coordination of pharmacologists and clinical investigators.

Routes of Administration

It is important to state clearly what route of administration is used and for what reason this route is chosen (oral, intramuscular, intravenous, or rectal). Although the oral route is the most widely used and has many advantages, it is not always controllable in some psychiatric conditions. Special precautions should therefore be taken by the investigator to insure actual ingestion of the agent. It should be clearly stated in the report that such precautions have been taken. In addition, the type of oral preparation used (tablets, capsules, or liquid) should be indicated.

In regard to parenteral administration, the presence or absence of local tissue irritation and pain must be noted since these might also have important psychological significance.

Dosage and Duration of Treatment

To permit proper assessment of the multiple problems concerned with dosage schedules, it is recommended (a) that specific individual dosages, preferably in metric units, not tablets or ampules, should be reported (for parenteral routes, the concentration and volume, as well as any other constituents injected, should be noted) and (b) that the frequency of repeated administration should be clearly indicated (for example, once a day) and the technical reasons be given (for example, duration of action or technical problems of administration).

When possible, the range of effective dosage might be expressed as milligrams of the drug per kilograms of body weight. It is desirable

that blood and urine concentrations of drugs be quantitatively determined as soon as methods are available and circumstances permit.

The reasons for the choice of a particular dosage schedule and for the length of treatment are of considerable importance and should be clearly specified. At this stage, a schedule appropriate to the needs, tolerance, and response of the individual patient is generally preferable to a routine fixed schedule. When a fixed schedule is used, the rationale should be stated explicitly.

The report should describe such factors as source of basic information on the drug, onset and duration of the illness (acute, subacute, chronic—clearly defined), and symptomatology and diagnosis.

All members of the committee strongly feel that the complexities of therapeutic objectives cannot yet be reduced to a definitive statement in view of the present incomplete knowledge. Nevertheless, reports should contain a clear statement of the basic concepts governing the investigator's therapeutic goals (symptomatic relief, increased responsiveness to other therapies, specific cure, or social rehabilitation, for example) because these therapeutic goals probably play an important role in regulating dosage and duration of the drug therapy.

Drug-Induced Deviations

All deviations from the physiological and psychological norms occurring during the course of drug therapy should be observed and recorded carefully. Statements regarding the reliability of the observer (physician, nurse, family, or patient), the clinical significance of drug reactions (annoying, or serious, or critical), and the incidence of reaction are desirable. Determination of the true frequency of any side reaction, however, cannot be reliably established until sufficiently large numbers of patients in various settings have been observed for an adequate period of time.

Careful consideration should be given to pre-existing diseases, constitutional predispositions, and secondarily induced complications (for example, vitamin deficiency due to interference with appetite and food intake). If other drugs are employed to control disturbing side effects, full details as to type of drug, dosage,

all adverse factors which may operate to cripple the brain of the new individual.

Many of the methods employed in arriving at some estimation of the degree of mental deficit in cerebral palsy patients are subject to error. The frequency, degree, and kind of mental deficit as yet have not been accurately determined. Nevertheless, there is no doubt that mental retardation is more frequent among cerebral palsy patients than it is in the general population. It must be investigated along with other deficits following asphyxia neonatorum or other adverse factors in the perinatal period.

The condition which most clinical investigators consider cerebral palsy has been ascribed to almost every conceivable cause: hereditary factors, malformations or maldevelopment of the brain, disease or injury of the mother, prematurity, hemorrhage, deprivation of oxygen, mechanical injury of the brain at birth, incompatibility of Rh factor, and so forth. Anoxia or asphyxia at birth as causes of cerebral palsy have strong advocates. It has been claimed that anoxia and cerebral hemorrhage (which may result from anoxia) are the two most important causes of cerebral palsy. The role of obstetrical anesthesia as a possible causal agent in production of cerebral palsy has been debated pro and con.

A thorough search of the literature reveals not only that cerebral palsy and mental retardation are thought to have many causes, including neonatal asphyxia, but also that asphyxia at birth can have many effects. Indeed, it sometimes seems to result in no observable effect at all. One reason for the lack of visible effect may be the difficulty of determining whether or not an infant has been subjected to anoxia, which implies complete lack of oxygen, or only to hypoxia, which implies reduced amount of oxygen. In hypoxia, no permanent damage may be encountered even though the infant may display many signs of respiratory embarrassment.

Clinical Research

Clinical studies of possible interrelation of neonatal asphyxia, cerebral palsy, and mental retardation, to which I refer, are of two main types. The majority are characterized by

selection of a group of patients who have cerebral palsy or are mentally retarded, or both, and attempting to review their histories in order to determine whether or not evidence exists of some type of birth injury. This retrospective research has features which make its results difficult to interpret. There is an immediate source of bias because the cases are selected on the basis of the appearance of the condition that is to be studied, for example, cerebral palsy. The old notes and measurements that were taken at birth were put in the record with no thought of future research and are nearly always inadequate and often unreliable. The retrospective type of clinical investigation is not worthless, but it can produce little more than trends which must be put to tests in other ways.

A more precise method of clinical research is characterized by letting nature select the cases while the investigator makes the measurements of the various factors and conditions that may prejudice well-being in the years to come. The patients are followed for a period of time during which measurements are repeated and the course of development and growth charted. This we call prospective research. Much of the bias and unreliability inherent in the retrospective type of investigation are eliminated. Attending prospective research, however, is the risk of losing cases in the followup. For example, if neonatal asphyxia leads to death or incarceration, only the patients with the mildest or perhaps undetectable damage will be left in the series. The followup studies must be carefully conducted to keep track of the lost cases. The prospective type of investigation requires careful planning and long-term financial support. For these reasons it has not been as popular as the retrospective type.

I have emphasized these points of difference in approach to clinical investigation in this field because of the importance of establishing projects which give the most promise of arriving at definite and positive conclusions. There is great need for research of the prospective type. To help fill the need, the National Institute of Neurological Diseases and Blindness of the Public Health Service is spon-



Neurological and Psychological Deficits From Asphyxia Neonatorum

WILLIAM F. WINDLE, Ph.D., Sc.D.

IT is estimated that more than 500 articles have been published on various aspects of cerebral palsy and mental retardation and possible relationships of one or the other to anoxia or asphyxia at birth. Data have been collected and analyzed in less than one-fifth of these studies. A relationship between birth injury of some sort, including that induced by asphyxia neonatorum, and later neurological and mental disturbances has been suggested in most of the later articles. With so much written about these subjects, it is surprising that so little definitive research has been done.

Recently there has been a renewal of interest in the neurological and psychological deficits resulting from adverse factors in the perinatal period (the period from the first viability of the fetus to approximately one month after birth).

Dr. Windle is chief of the Laboratory of Neuro-anatomical Sciences, National Institute of Neurological Diseases and Blindness, Public Health Service. His paper is based on an address given at the 1956 annual meetings of United Cerebral Palsy Associations in Cleveland and the American Academy for Cerebral Palsy in Chicago. It summarizes parts of chapters by Dr. C. J. Bailey and Dr. W. F. Windle which will be published later in a monograph with full bibliography by Charles C. Thomas, Springfield, Ill.

At the end of August 1956, a Conference on Asphyxia Neonatorum, Brain Damage, and Impairment in Learning was held at the University of Puerto Rico School of Medicine for the purpose of bringing together, to plan a course of future studies in animals, investigators in several disciplines who are currently engaged in research or are planning research in this field. Among the accomplishments of the San Juan conference was a thorough review of the present status of the problem.

The number of persons in the United States afflicted by cerebral palsy or mentally retarded, or both, because of some damage to the nervous system occurring during the perinatal period is not accurately known, and the number of new cases added each year is uncertain. However estimates of a prevalence ranging from 336,000 to 550,000 and an incidence of 10,000 new victims have been quoted in lay circles. If these figures serve no other purpose, they remind us that the wastage in lives and resources is a major one deserving great effort toward correction.

How does one define cerebral palsy? There is no agreement. One group would include all organic central nervous injuries incurred during the perinatal period; others would limit the definition to neuromuscular defects. From the research standpoint, one must take the broad view and try to learn as much as possible about

resuscitation, and up to 5 or 6 days, multiple small hemorrhages were found in the brains. Some neuronal changes unrelated to hemorrhages were manifested as early as 90 minutes after resuscitation. Two to six days later, certain nerve cells had lost their chromophilic substance, the phenomenon of chromatolysis culminating in destruction of isolated cells or groups of neurons. Some animals showed general neural damage with atrophy of the brain; others were affected in focal areas only. The cerebellum, hippocampus, and corpus striatum, three parts of the human adult brain considered to be easily damaged by oxygen lack, were not severely injured in the newborn guinea pig. Certain other parts of the brain, notably the lateral thalamic nuclei and geniculate bodies—way stations in the important sensory pathways to the cerebral cortex—were more frequently involved in the degenerative processes than any other parts of the brain. The cerebral cortex came next.

At 6 to 8 weeks of age, many of the guinea pigs were given learning tests in a simple alternation maze. Most of the asphyxiated animals were found to be inferior to their controls in terms of the number of errors made in the maze and repetition of errors. The differences were significant at or beyond the 1 percent level. All the animals used for the learning tests were subsequently sacrificed for histopathological study. Anatomical changes attributable to asphyxiation were encountered in the brain tissue of 65 percent of the asphyxiated animals. Most of these animals had been inferior to their controls in the maze, and not one of them had been superior to its control. Neuronal loss, sensory pathway damage, and cortical atrophy were found in the brains and may have been the causal factors in the animals' learning deficits.

The main point gained from these experiments is that guinea pigs asphyxiated and resuscitated at birth, showing transient neurological deficits, grew to maturity as overtly normal animals. Nevertheless, the majority of them had brain damage and, correlated with it, impaired learning ability. Although they cannot be likened to palsied human beings (most palsied animals died very young), one

is tempted to draw a comparison with mentally retarded humans.

Except for the one isolated monkey experiment, mentioned earlier, no studies have been made in primates. In order to approach human conditions more closely than has hitherto been possible, additional experiments such as those in the guinea pigs are now being planned in primates. The rhesus monkey lends itself particularly well to studies of this type. It is a much more suitable animal for neurological examination than are other common laboratory species. For example, it is easier to get an electroencephalogram from a monkey than it is from a rat. The female has a regular 28-day menstrual cycle, like the human being. It usually gives birth to a single baby, rarely to twins. Pregnancy lasts 168 days, but viable infants have been born as early as the 150th day. The infant monkey can be removed from its mother's breast at birth, and, after an initial period of round-the-clock care lasting about 4 weeks, it can live quite independently. This infant is capable of solving certain problems within the first 5 days after birth. It is possible to test it at that time for deficits in learning ability caused by adverse factors which were deliberately induced during the prenatal period.

In view of these considerations, a group of scientists at the Laboratory of Neuroanatomical Sciences, Public Health Service, has begun investigating neurological and psychological deficits caused by adverse factors during the perinatal period of the rhesus monkey. The Institute of Neurological Diseases and Blindness has established a laboratory of perinatal physiology in San Juan as one component of a cooperative project involving, in addition, some of the medical faculty of the University of Puerto Rico. The free-range colony of rhesus monkeys on Santiago Island has been acquired, and animals from this colony will ultimately be used for these studies. In addition, the laboratory in San Juan has a caged colony of rhesus monkeys for controlled matings.

One of the most important results of the recent conference was a decision to try to encourage others to make greater use of primates, and a resolution to this effect was placed

soring a broad program of cooperative, prospective clinical investigations.

Animal Experimentation

Clinical studies have been unable to tell us whether or not asphyxia neonatorum is the predominant cause of the brain damage which results in cerebral palsy and ultimately mental retardation or whether there are other factors of equal or greater importance causing the neurological and psychological deficits. Many investigators are convinced that no amount of clinical investigation will ever give a final answer. They believe this is clearly a case for the laboratory scientist and that it should be possible to obtain the answer from animal experiments in which anoxia at birth can be deliberately brought about—in which it does not just happen. In view of the long felt need for experimentation along these lines, it is amazing that so little animal work has been done. Only 5 teams of investigators have published results of research of this type during the past 30 years, and only 2 of these are active at present. It is only fair to add, however, that several additional groups have begun animal experiments recently, and we may expect to hear reports from them in the not too distant future.

Reports were given at San Juan by several of the investigators who had studied brain damage after neonatal anoxia or hypoxia in animals, mostly in rats, chickens, and guinea pigs. One presented a short motion picture film illustrating effects of asphyxiation and resuscitation at birth of a newborn monkey. Aside from this single experiment, I know of no studies in higher mammals.

Experiments on guinea pigs conducted in my laboratories at Northwestern University Medical School several years ago remain the most definitive series of animal experiments available. The observations form the basis for present plans to study neurological and psychological deficits related to adverse factors in the perinatal period of higher mammals.

Pregnant guinea pigs at full term were given a local anesthetic. One fetus of the litter was immediately delivered by cesarean section to serve as a control for one or more litter mates

which were asphyxiated by occluding the blood vessels leading to the uterus or clamping the umbilical cords for various lengths of time, usually about 15 to 20 minutes. These asphyxiated animals had to be resuscitated. This was brought about by gently inflating their lungs rhythmically with oxygen, a process which required well over an hour in some instances—roughly proportional to the duration of the asphyxiation.

Regardless of how short a time they had been asphyxiated, all the guinea pigs which were resuscitated exhibited neurological deficits, at least transiently. The more prolonged the asphyxiation, the more marked and persistent were the neurological deficits. After respiration had been established, the animals remained in coma for a short time. Then a series of motor phenomena ensued. Convulsive twitchings of the muscles of the face and limbs, decerebrate states, and coordinated running movements appeared before the animals could right themselves. Tremors, ataxia, spastic gait, incoordination, and unresponsiveness to loud sounds or bright lights sometimes persisted for several days or even longer. Survival of the most severely palsied guinea pigs was brief. Motor recovery, when it occurred, was more rapid and complete than recovery from the sensory deficits. Occasionally, an animal displayed convulsions after it appeared to have recovered normal motor function. This may have been a more common occurrence; constant vigil was not kept. By 2 weeks after resuscitation it was usually impossible to detect neuromotor deficits in the surviving animals, but some of them appeared to be dull and unresponsive to tactile, auditory, or photic stimulation. They permitted themselves to be handled, and when placed in unusual positions they remained as though cataleptic.

The brains of most asphyxiated animals and their nonasphyxiated controls were collected for histopathological studies. They formed a series gradating from 1 hour to several months after asphyxiation. Brain pathology was found in nearly all the animals that had been asphyxiated for 8 minutes or more and in some of those which had been asphyxiated for less than 8 minutes. About 1 hour after

resuscitation, and up to 5 or 6 days, multiple small hemorrhages were found in the brains. Some neuronal changes unrelated to hemorrhages were manifested as early as 90 minutes after resuscitation. Two to six days later, certain nerve cells had lost their chromophilic substance, the phenomenon of chromatolysis culminating in destruction of isolated cells or groups of neurons. Some animals showed general neural damage with atrophy of the brain; others were affected in focal areas only. The cerebellum, hippocampus, and corpus striatum, three parts of the human adult brain considered to be easily damaged by oxygen lack, were not severely injured in the newborn guinea pig. Certain other parts of the brain, notably the lateral thalamic nuclei and geniculate bodies—way stations in the important sensory pathways to the cerebral cortex—were more frequently involved in the degenerative processes than any other parts of the brain. The cerebral cortex came next.

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One of the most important results of the recent conference was a decision to try to encourage others to make greater use of primates, and a resolution to this effect was placed

in the minutes. As one of the investigators expressed it: "Problems in the brain of the human newborn infant and the human fetus are insolvable without experimental animals. The rhesus monkey seems to be the laboratory primate of choice for research of this type. It is therefore recommended that this animal be established as the standard laboratory animal for research in the area covered by this con-

ference." With what has been learned in lower animals, with that which will be learned in laboratory primates, and with the information being obtained on human beings through adequately supported and well-controlled prospective clinical investigations, some of the answers to the question of cause and prevention of brain damage at birth should eventually be obtained.

Grants for Training in Epidemiology and Biometry

The Public Health Service has awarded 21 grants totaling \$702,494 to 5 schools of medicine and 9 approved schools of public health in the United States to encourage graduate training in epidemiology and biometry.

Specifically, the purpose of the awards is to foster more extensive use of statistics in the life sciences through the special techniques of biometry and more epidemiological study of the characteristics and distribution of health problems in population groups.

The grants include 97 training stipends: 69 in biometry and 28 in epidemiology. Also included are funds for payment of salaries for additional teaching staff in the training institutions.

Additional grant applications totaling \$548,528 are awaiting review at the next meeting of the Advisory Committee on Epidemiology and Biometry. The committee, made up of 17 leaders in these fields of study, was appointed by the Surgeon General to guide the program and review research grant applications. The list of grants follows.

Biometry

| | |
|--|----------|
| University of California School of Public Health, Berkeley..... | \$24,550 |
| University of California School of Public Health, Los Angeles..... | 16,661 |

| | |
|--|--------|
| Columbia University School of Public Health and Administrative Medicine..... | 29,921 |
| Harvard University School of Public Health... | 20,000 |
| Johns Hopkins University School of Hygiene and Public Health..... | 17,973 |
| University of Michigan School of Public Health..... | 18,792 |
| University of Minnesota School of Public Health..... | 28,640 |
| New York State University College of Medicine, Brooklyn..... | 14,984 |
| University of North Carolina School of Public Health..... | 22,464 |
| University of Oklahoma School of Medicine... | 35,400 |
| University of Pittsburgh School of Public Health..... | 19,980 |
| Tulane University School of Medicine..... | 22,454 |
| Vanderbilt University School of Medicine... | 13,255 |
| Yale University School of Medicine..... | 20,432 |

Epidemiology

| | |
|--|----------|
| University of California School of Public Health, Berkeley..... | \$22,250 |
| Columbia University School of Public Health and Administrative Medicine..... | 52,746 |
| Harvard University School of Public Health... | 63,936 |
| University of Michigan School of Public Health..... | 71,520 |
| University of Pittsburgh School of Public Health..... | 48,784 |
| Tulane University School of Medicine..... | 58,447 |
| Yale University School of Medicine..... | 79,239 |

Plant Disease Fungi In Sewage Polluted Water

WILLIAM BRIDGE COOKE, Ph.D., and
PAUL W. KABLER, M.D., Ph.D.

THE plant pathologist is characteristically interested in the source of infectious agents of the many plant diseases with which he has to deal. Of crops which have been under cultivation for long periods of time, the various diseases to which they are subject seem to be as old as the host plant. These diseases may be with the host at all times (systemic), or they may be carried by the host seed. They may overwinter on dead plant tissues on the ground, complete their life cycle in the spring, and reinfect the host at that time. Or they may overwinter in the soil as members of the extensive population of soil micro-organisms in dead plant tissue or as resting spores or cells in the soil.

It has long been known that many fungal spores can be carried from a locus of spore production to an infection site by the wind. Some of those which are airborne may incidentally cause allergies; others may settle out of the air in places where their activities are undesirable, causing food and material spoilage.

Water has not been considered seriously as a means of disseminating plant disease spores. Spores which settle out of the air into water and are carried impassively to another point may not reproduce in the water and are not considered of importance in this medium. An obligate parasite such as rust or powdery or downy mildew is not known to have spores capable of germination and growth in water. Soil fungi are known to have spores which are carried in streams, but these are thought to be contaminants, and serious attention is not paid

to the possibility of their germination and reproduction in liquid menstrooms.

Sewage Irrigation

The literature of sewage and waste disposal contains many references to the use of sewage as a source of supplemental irrigation water. References are increasing as studies are made in drier parts of the country where sewage and other wastes can be of increasing use in reclamation of water. Skulte (1) states: "Skillfully designed and properly managed sewage farming has been operated for decades in Europe, and for several years in some localities in the southwestern areas of the United States, without danger to personnel and without creating nuisance conditions. As a new science, irrigation with sewage effluent is still in the experimental stage and many problems need to be solved in the fields of bacteriology, biology, hygiene, soil structure, and the physiology of plants."

State and Federal agencies have been interested for many years in the use of sewage as an irrigation supplement. According to Hunt (2) most communities in the United States could use supplemental irrigation during annual periods of drought. Methods of reclaiming sewage for re-use in irrigation have been described by Hutchins (3) and are being studied in California by Bush and Mulford (4) and Merz (5). Water, the Yearbook of Agriculture for 1955 (6,7), contains several articles by Department of Agriculture and Public Health Service personnel, showing an undercurrent of interest in this problem. On the research level, certain recent studies indicate some of the problems involved. The effect of spreading rather than furrowing in irrigation technique has been investigated by Bush and Mulford (4) and by Greenberg and Thomas (8). A study by Henry and associates (9) was designed to indicate the influence of sewage waters on mineral content, organic content, soil structure, and other aspects of soil quality. In such studies it has been found that the most important mineral problem is that of sodium which sewage seems to add to soils.

In a popular article by Stone (10), it was pointed out that sewage could be used for a

Dr. Cooke is in charge of fungus studies, and Dr. Kabler is chief of microbiology, Water Supply and Water Pollution Program, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio.

number of irrigation purposes. Besides irrigating crop plants, it could be used for irrigation of lawns and ornamental plantings. Illustrations of several types of use are given in his article.

In his *Biology of Root-Infecting Fungi*, Garrett (11) sums up his thesis with a statement to the effect that, until a crop is grown in a soil free from disease infestation, one cannot appreciate the exceptionally healthy nature of the plants which produce that crop or the losses in crop values of diseased plants. We may assume that this consideration can also apply to soils into which disease organisms, however unapparent they may be, are dumped on a periodic and perhaps daily schedule.

Menzies (12) has pointed out that certain plant pathogens have become more and more a problem to the plant pathologists as the practice of irrigation increases in the Columbia Basin. Those pathogens mentioned are airborne leaf and fruit diseases rather than waterborne soil fungi and have been introduced with the crop or have migrated to the spot in much the same manner as other rusts, mildews, and host-restricted pathogens. His forecast that other diseases could become important in the region is of interest.

Prior to 1952 the presence of fungi in polluted waters and sewage was considered by most workers in the field of sanitary science to be an established fact but not worthy of special investigation. It was obvious that under certain conditions of pollution a stream or a trickling filter would develop growths which were thought to be fungi and were identified to species in occasional studies (13). No reference to the isolation or identification of plant pathogens as such from raw sewage or partially treated waters has received our attention.

Aqueous Acclimatization

The routine study of a small polluted stream, of a secondary-type sewage treatment plant at Dayton, Ohio, at monthly intervals, and of other habitats at less frequent intervals yielded quantitative and qualitative data concerning the presence of soil fungi in these habitats (13). Various media were tested and techniques used that are common to the

study of soil microbiology. From these studies it appears that certain strains of species of soil fungi have become acclimated to living in aqueous habitats. Spore production is atypical when present, and certain tested species are able to use dissolved oxygen in competition with other sewage organisms for reduction of organic materials (14). Most of the species tested are able to produce their own vitamin supply, and all are able to utilize simple sugars and organic as well as ammonia nitrogen.

Some of the fungi isolated from sewage polluted water are listed in the table, together with some of the diseases of crop and ornamental plants which are attributed to them. Some of the species were isolated only once or rather infrequently. Other species were very common, and some appeared in a large number of samples tested for fungi. In some cases these fungi were found only on trickling filters in a sewage treatment plant, indicating that other habitats in the plant, such as Imhoff tanks, secondary sludge digesters, preaeration tanks, and so forth, were not favorable habitats for their survival. Seasonal distribution is sometimes apparent because certain species are found only in 1 or 2 seasons of the year.

Garrett (11) considers seedling blight and vascular wilt fungi as "ecologically obligate parasites"; that is, while they are able to grow alone or in competition with other fungi on culture plates, in the soil they appear to be unable to compete with strictly saprobic fungi for the dead organic matter present there. On the other hand, there is evidence that in sewage and related habitats they can reproduce, as indicated by observations on the degradation of hydrocarbons.

Strains From Domestic Sewage

Strains of both *Fusarium oxysporum* and *Fusarium solani* have been recovered at one time or another from domestic sewage. To determine the degrading ability of sewage organisms for various types of industrial wastes such as hydrocarbons, domestic sewage was seeded into experimental materials (15). During the period of observation of one experiment, two groups of organisms developed in large quanti-

ties, a protozoan and a strain of *F. oxysporum*. In a later experiment this strain was added to a suspension of motor oil in dilution water. After 3 weeks the fungus had produced almost

Plant diseases caused by some fungi isolated from sewage-polluted waters

| Fungus | Disease |
|---------------------------------------|---|
| <i>Alternaria tenuis</i> ----- | Leaf spot of cotton, seed mold of brome, seed mold and secondary leaf spot of buckwheat, other diseases of other hosts. |
| <i>Aspergillus niger</i> ----- | Fig smut, date smut, black mold of onions. |
| <i>Botrytis cinerea</i> ----- | Black rot and leaf blight of lettuce, storage rot of sugar beets, other diseases. |
| <i>Cephalosporium</i> spp----- | Diseases of soybeans, celery, sugar cane, and other plants. |
| <i>Chaetomium funicolum</i> ---- | Seed mold. |
| <i>Chaetomium globosum</i> ----- | Seed mold. |
| <i>Cladosporium cladosporioides</i> , | Seed mold. |
| <i>Coniothyrium fuckelii</i> ----- | Canker of apple, graft canker of rose. |
| <i>Curvularia lunata</i> ----- | Brown spot of gladiolus. |
| <i>Epicoccum nigrum</i> ----- | Glume spot, smudge of wheat. |
| <i>Fusarium moniliforme</i> ----- | Seedling blight of oats, secondary root rot of barley, ear rot of corn. |
| <i>Fusarium oxysporum</i> forms. | Root infections of such plants as: celery, China aster, onion, cabbage, gladiolus, flax, tomato, alfalfa, muskmelon, watermelon, peas, narcissus, sweet potato, spinach, bananas. |
| <i>Fusarium solani</i> forms----- | Among other plants, onions, sweet peas, peas, potatoes. |
| <i>Penicillium digitatum</i> ----- | Blue mold rot of citrus fruit. |
| <i>Penicillium expansum</i> ----- | Blue mold of oats, barley, broom corn, millet, wheat, apples. |
| <i>Penicillium italicum</i> ----- | Blue mold rot of citrus fruit. |
| <i>Penicillium oxalicum</i> ----- | Seedling blight of corn, mold of corn grains and cobs. |
| <i>Trichoderma viride</i> ----- | Seed rot of corn and barley, seed mold of wheat, green mold rot of muskmelon. |

as much breakdown of the oil as had domestic sewage tested at the same time in similar solutions. Similar sewage seed was used to develop a slime on an experimental trickling filter in which hydrocarbons of airplane cleaning materials were treated. Upon plating the slimes it was found that a strain of *F. solani* was the predominant fungus present.

In certain communities, sewage in various stages of treatment is used as a source of irrigation supplements. The raw sewage can contain fungal spores introduced from such sources as runoff from soils following precipitation or lawn and flower bed irrigation, washings from infected or moldy plant parts, milked materials, or contaminated plumbing, where growths can occur between intermittent flow periods. In other communities, effluents from primary settling tanks or Imhoff tanks are used, and in some cases secondary treatment processes may be bypassed. In still other communities, effluents from complete or secondary treatment plants may be employed. Depending on the type of treatment, that is, whether recirculation is practiced or whether the plant is overloaded, the effluent may be rich or poor in fungus disseminules. Seasonal activity within the treatment plant or in the various places from which its populations are derived could give a seasonal pattern to the microorganisms in the effluent. The sludges used for supplemental fertilizers or soil conditioners may have developed a population of organisms that could produce trouble in the field or at least add to the populations of microorganisms in the field awaiting favorable conditions for infecting crop plants.

Contamination of Plant Parts

Not only are crop plants growing in the field subject to inroads by fungus disease, but the products of such crops may become infected by fungi. Seeds and grains may become contaminated by fungi during or after harvest, and in some cases spores of disease-producing fungi may be formed together with the seeds to which they adhere, thus supplying inoculum for infecting the seedling. Succulent plant parts may become infected by soil fungi, or by fungi existing in the soil capable of infecting only

number of irrigation purposes. Besides irrigating crop plants, it could be used for irrigation of lawns and ornamental plantings. Illustrations of several types of use are given in his article.

In his *Biology of Root-Infecting Fungi*, Garrett (11) sums up his thesis with a statement to the effect that, until a crop is grown in a soil free from disease infestation, one cannot appreciate the exceptionally healthy nature of the plants which produce that crop or the losses in crop values of diseased plants. We may assume that this consideration can also apply to soils into which disease organisms, however unapparent they may be, are dumped on a periodic and perhaps daily schedule.

Menzies (12) has pointed out that certain plant pathogens have become more and more a problem to the plant pathologists as the practice of irrigation increases in the Columbia Basin. Those pathogens mentioned are airborne leaf and fruit diseases rather than waterborne soil fungi and have been introduced with the crop or have migrated to the spot in much the same manner as other rusts, mildews, and host-restricted pathogens. His forecast that other diseases could become important in the region is of interest.

Prior to 1952 the presence of fungi in polluted waters and sewage was considered by most workers in the field of sanitary science to be an established fact but not worthy of special investigation. It was obvious that under certain conditions of pollution a stream or a trickling filter would develop growths which were thought to be fungi and were identified to species in occasional studies (13). No reference to the isolation or identification of plant pathogens as such from raw sewage or partially treated waters has received our attention.

Aqueous Acclimatization

The routine study of a small polluted stream, of a secondary-type sewage treatment plant at Dayton, Ohio, at monthly intervals, and of other habitats at less frequent intervals yielded quantitative and qualitative data concerning the presence of soil fungi in these habitats (13). Various media were tested and techniques used that are common to the

study of soil microbiology. From these studies it appears that certain strains of species of soil fungi have become acclimated to living in aqueous habitats. Spore production is atypical when present, and certain tested species are able to use dissolved oxygen in competition with other sewage organisms for reduction of organic materials (14). Most of the species tested are able to produce their own vitamin supply, and all are able to utilize simple sugars and organic as well as ammonia nitrogen.

Some of the fungi isolated from sewage polluted water are listed in the table, together with some of the diseases of crop and ornamental plants which are attributed to them. Some of the species were isolated only once or rather infrequently. Other species were very common, and some appeared in a large number of samples tested for fungi. In some cases these fungi were found only on trickling filters in a sewage treatment plant, indicating that other habitats in the plant, such as Imhoff tanks, secondary sludge digesters, preaeration tanks, and so forth, were not favorable habitats for their survival. Seasonal distribution is sometimes apparent because certain species are found only in 1 or 2 seasons of the year.

Garrett (11) considers seedling blight and vascular wilt fungi as "ecologically obligate parasites"; that is, while they are able to grow alone or in competition with other fungi on culture plates, in the soil they appear to be unable to compete with strictly saprobic fungi for the dead organic matter present there. On the other hand, there is evidence that in sewage and related habitats they can reproduce, as indicated by observations on the degradation of hydrocarbons.

Strains From Domestic Sewage

Strains of both *Fusarium oxysporum* and *Fusarium solani* have been recovered at one time or another from domestic sewage. To determine the degrading ability of sewage organisms for various types of industrial wastes such as hydrocarbons, domestic sewage was seeded into experimental materials (15). During the period of observation of one experiment, two groups of organisms developed in large quanti-

Human Brucellosis in Indiana, 1946-50

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THROUGH cooperative projects between national and State agencies, various aspects of brucellosis were investigated in Indiana during the 5-year period 1946-50. Because the data provide detailed information concerning the largest population groups at risk during the period of the highest reported national incidence of brucellosis, the findings of this investigation are belatedly presented. This paper reports laboratory findings and results of followup investigation of persons with positive agglutination tests for brucellosis, with emphasis on both clinical and epidemiological information. Specific areas of investigation and research have been presented by other investigators (1-5).

Methods

An unknown number of persons are never included in this type of survey because their

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The project was sponsored jointly by the Public Health Service and the Indiana State Board of Health, with the assistance of the department of veterinary science, Purdue University, Lafayette, Ind.

blood specimens are sent to private laboratories or are tested in hospitals. The persons selected for inclusion in this study were essentially ambulatory outpatients for whom the doctor had submitted a blood specimen to the State laboratory for "febrile agglutination tests." Blood specimens were submitted more frequently by doctors in the more rural areas than by those in urban areas.

Cards requesting pertinent information were mailed to each patient who had a positive agglutination test and to his physician. The patient was requested to supply his name and address, county and township of residence, occupation, and type of food consumed. He was asked to indicate specifically whether or not he used raw milk or raw milk products. If he was a farmer or if he engaged in butchering, he was asked to indicate the type of farming (dairy, hogs, or mixed) and the type of butchering (commercial, home use, cattle, hogs). He was also asked to state whether or not he processed or prepared meat products for home or commercial use. The physician's card requested the name, age, and sex of the patient, diagnosis and stated duration of illness, and information on the presence of 12 selected symptoms.

If the cards were not returned within a month, one followup letter was sent. No further followup was feasible.

Data on 667 of the 884 patients in the study were supplied by the physician; on 596, by the patients; and on 549, by both physician and patient. When information on any characteristic was needed from both physician and patient, the records used were those of the 549 patients for whom records were received from both sources.

For any single characteristic there will be a

such plant parts. These include leaves, shoots, petioles, tubers, roots, and other similar edible plant parts harvested for domestic use. The flowers and fruits of many crop plants can readily become infected with fungi growing or existing in the soil. All plant parts may be subject to additional infection from fungi added to the soil in sewage polluted waters used as irrigation supplements. These fungi can become a great problem and produce tremendous losses before the foods which have been harvested reach the consumer since, under improper conditions of transport, storage, warehousing, and marketing, large numbers of fruits and vegetables can be lost by spoilage. The cycle can be repeated when the waste produce is discarded into the sewerage system and the inoculum present is added to the organisms growing in various parts of the sewage treatment plant, or to that present in the soil if the sewage is applied to the field.

The paradox of the situation is that under certain circumstances a fungus that could cause considerable damage in a field could be actively purifying the sewage in which it is living. Should a treatment for such wastes be developed in which fungi were the principal microbiological agents, and should the effluents containing spores or other disseminules be applied as irrigation supplements indiscriminately, it is likely that an inoculum for disease of a crop plant could develop.

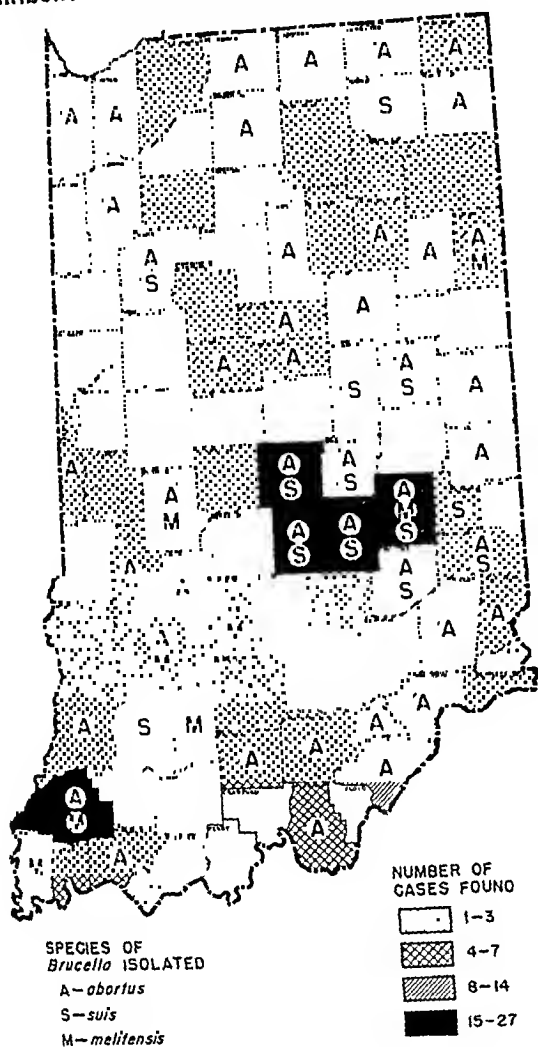
It thus appears that in these days of increased supplemental irrigation by use of sewage and polluted water, the plant pathologist and the public health official are confronted with additional problems of disease control. Unfortunately, the control of one fungus chemically may inhibit the work of many beneficial organisms; hence, control measures necessary for irrigation waters should be applied to effluents rather than to influents of the sewage treatment plant. It is possible that adequate control of plant pathogens may also result in adequate control of human pathogens, so that a wider use could be made of sewage effluents than is being made today.

The role of fungi added to the soil by sewage-polluted irrigation waters in contributing to crop and plant infections certainly merits attention.

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Distribution of brucellosis in Indiana, 1946-50



cidence of brucellosis, beginning at about age 17, reaching a peak at age 30, and decreasing in the thirties. There were sharp peaks in incidence at ages 38 and 40, a slow decline to age 70, and then a more rapid tapering off, the oldest recorded age at onset being 74 years.

No age record was available on approximately one-third of the persons in the study, largely because no information was received from the doctor. The age curves were similar whether or not the physician had made a diagnosis of brucellosis. When the patient's age was recorded, 84 percent of the males and 87 percent of the females were diagnosed as having brucellosis. Only 15 percent of those of unrecorded age were diagnosed.

In 90 percent of the diagnosed cases, the reported duration of illness was 1 month or longer. Adjustment for recorded duration reduced the average age at onset by 12.6 months, 9.7 months for males and 22.3 months for females. The longest average durations were found in the group aged 25-49 years, 10.6 months for males and 26.1 months for females. Duration of illness was shortest in the group under 25 years of age, 7.6 and 6.7 months respectively; those 50 years of age or older had average durations of 8.0 months for males and 24.4 months for females.

Geographic Distribution

The distribution of brucellosis cases and isolations is shown on the map. Only 6 counties had no cases during the 5-year study period. The number of cases is based largely on the recorded diagnosis of the doctor. A few cases were classified as brucellosis if the organism was isolated or if an agglutination titer of 1:320 or over was found. Gibson, Marion, Johnson, Shelby, and Rush Counties contributed more cases than any other counties, and all had records of isolation of at least two species of *Brucella*. In counties where *B. abortus* alone was isolated, there was no marked concentration of cases.

Isolations were made from residents of 52 of the 92 counties in Indiana. All three species of *Brucella* were isolated from patients from Rush County. *B. abortus* was by far the most common species found and was distributed throughout the State. *B. suis* was most common in the east central area, in a group of contiguous counties with large swine populations. *B. melitensis* was found in 8 counties, 6 of which were in the southwestern part of the State. *B. suis* and *B. melitensis* are regarded as having more discrete enzootic foci in swine. The isolations of *B. melitensis* in Gibson County were largely from packinghouse workers who worked exclusively with swine.

Symptomatology

Remembering that the doctor is only human and therefore subject to errors in memory, that the patient may not describe his symptoms ac-

residue of unknowns, either because the questions were not answered or because the answers could not be interpreted. Symptoms not checked by the physician were considered to be absent.

The record in the State laboratory included the month of the test, complete agglutination reading (0-4+ for each dilution 1:20 through 1:1,280), and species of *Brucella* isolated. The information received from the patients and the doctors and the information on the laboratory record were coded, and the complete record for each test was machine punched on one card. Tabulations could then be devised to provide figures for any facet of the data.

Results

During the 5-year study period, 35,683 blood specimens were tested: 838 specimens had at least a 4+ agglutination at a dilution of 1:80; 1,998 had some reaction at a dilution of 1:40; 32,487 showed no reaction to the *Brucella* antigen.

Of 1,332 bloods selected for investigation, 13 persons were diagnosed "other disease" and

were omitted from the study. Of the remaining 1,319 individuals, 102 had entries in more than 1 year, and 333 had multiple tests within the same year; therefore, only 884 persons were actually included in the study. Unfortunately, the number of negative tests on blood specimens from the 884 individuals is unknown.

Brucella species were isolated from 139 specimens from 124 patients: *B. abortus* from 87, *B. suis* from 25, and *B. melitensis* from 12. Some multiple isolations were made on the same specimen (1,4,5).

Age and Sex

In table 1, the survey population is defined by age and sex for various attributes. The incidence of brucellosis among females, after adjustment for recorded duration of illness before entry into the study, was highest at ages 24-28 and lower but fairly steady through age 50, with a few scattered cases in the ages up through the low seventies. The oldest patient was 77 years old at the time of onset of illness. Males, after similar adjustment for recorded duration of illness, showed a rapidly rising in-

Table 1. Age and sex distributions of various patient groupings

| Group and sex | Total | Age in years | | | | | | | | | | | | | | Un-known |
|---|-------|--------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-----|----------|
| | | 0-4 | 5-9 | 10-14 | 14-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60 and over | | |
| Total upon first examination | 884 | 1 | 6 | 10 | 16 | 43 | 75 | 85 | 76 | 68 | 64 | 47 | 39 | 51 | 303 | |
| Male | 674 | 1 | 3 | 6 | 11 | 32 | 54 | 70 | 61 | 58 | 51 | 37 | 28 | 39 | 223 | |
| Female | 210 | 0 | 3 | 4 | 5 | 11 | 21 | 15 | 15 | 10 | 13 | 10 | 11 | 12 | 80 | |
| Number diagnosed as brucellosis: | | | | | | | | | | | | | | | | |
| Male | 415 | 0 | 1 | 5 | 9 | 27 | 48 | 57 | 50 | 50 | 39 | 30 | 24 | 36 | 39 | |
| Female | 120 | 0 | 3 | 3 | 4 | 10 | 19 | 13 | 14 | 10 | 11 | 7 | 10 | 9 | 7 | |
| <i>Brucella</i> spp. isolated | | | | | | | | | | | | | | | | |
| Male | 106 | 0 | 0 | 3 | 1 | 7 | 16 | 17 | 4 | 10 | 6 | 8 | 3 | 6 | 25 | |
| Female | 18 | 0 | 0 | 0 | 1 | 2 | 6 | 2 | 0 | 2 | 0 | 1 | 0 | 0 | 4 | |
| Reported duration since onset (months): | | | | | | | | | | | | | | | | |
| Unknown or less than 1 | 404 | 1 | 1 | 3 | 5 | 17 | 19 | 17 | 18 | 12 | 13 | 9 | 7 | 11 | 271 | |
| 1-11 | 331 | 0 | 3 | 6 | 9 | 18 | 44 | 43 | 39 | 41 | 28 | 26 | 26 | 21 | 25 | |
| 12-47 | 103 | 0 | 1 | 1 | 2 | 5 | 11 | 17 | 12 | 11 | 10 | 11 | 3 | 12 | 7 | |
| 48 or more | 46 | 0 | 1 | 0 | 0 | 3 | 1 | 8 | 7 | 4 | 13 | 1 | 3 | 5 | 0 | |
| All known ages: | 451 | 2 | 2 | 8 | 11 | 34 | 64 | 67 | 62 | 57 | 46 | 33 | 30 | 35 | | |
| Male | 130 | 0 | 3 | 4 | 7 | 13 | 24 | 15 | 14 | 11 | 10 | 11 | 7 | 11 | | |
| Female | | | | | | | | | | | | | | | | |

¹ Adjusted to age at recorded onset.

Table 3. Probability of isolation of *Brucella* from blood clots, for each agglutination titer

| Titer level | Number of isolations | Probability | 95.5 percent confidence limits | |
|-------------------------|----------------------|-------------|--------------------------------|-------|
| | | | Upper | Lower |
| 0..... | 3 | 0.0004 | ----- | ----- |
| 1:40 ¹ | 34 | .098 | 0.130 | 0.066 |
| 1:80..... | 35 | .141 | .185 | .097 |
| 1:160..... | 29 | .171 | .229 | .113 |
| 1:320..... | 11 | .157 | .244 | .070 |
| 1:640..... | 8 | .258 | .415 | .101 |
| 1:1,280..... | 4 | .286 | .528 | .0 |

¹ Includes incomplete agglutinations at this titer.

course, there is always the possibility of re-infection.

These data clearly demonstrate a relation between titer and probability of isolation of *Brucella* even though the quantitative values cannot be assumed to provide a standard. Some one species of *Brucella* was found in the

blood samples of 124 of the 884 persons in the study (table 1). The population estimate for the negative blood specimens was 7,393 (5). The probability of making an isolation starts at 0.0004 for negative blood samples, is 0.10 for a titer of 1:40, rises to 0.17 for 1:160, and reaches 0.29 for 1:1,280, the highest dilution tested (table 3). Due to the decrease in numbers of specimens with increase in titer, the confidence limits of this relation are broad at the higher titers.

Although there was no strong correlation between blood titer and isolation of organisms, titers accompanied by isolation were higher for specimens taken 2 to 4 months after onset of illness than for those taken during the month of onset or the first month afterward. During the month of onset, titers for *B. suis* were definitely higher than titers for other species. Acute brucellosis was associated with a higher average titer than chronic brucellosis, but both ran the full range of titers.

Table 4. Seasonal distributions in various classifications of patients

| Table 4. Seasonal distributions in various classifications | | | | | | | | | | | | | | |
|--|---|------|------|------|------|------|------|------|-------|------|------|------|--------------------|-----|
| Classification | Month | | | | | | | | | | | | Total | |
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | | |
| Specimens submitted: ¹ All blood specimens..... First bloods only: Number..... Geometric mean titer..... Isolations of <i>Brucella</i> : Total..... <i>B. abortus</i> <i>B. suis</i> <i>B. melitensis</i> Brucellosis diagnosed by physician: Acute..... Chronic..... History of animal contact: ³ Any recorded contact..... No recorded contact..... | Distribution before adjustment | | | | | | | | | | | | | |
| | 93 | 85 | 110 | 86 | 99 | 108 | 137 | 144 | 121 | 141 | 83 | 110 | ² 1,317 | |
| | | | | | | | | | | | | | ² 882 | |
| | 65 | 55 | 81 | 60 | 72 | 74 | 98 | 94 | 76 | 86 | 51 | 70 | | |
| | 1:92 | 1:76 | 1:72 | 1:82 | 1:88 | 1:90 | 1:78 | 1:80 | 1:90 | 1:98 | 1:94 | 1:89 | | |
| | 10 | 7 | 6 | 12 | 10 | 17 | 17 | 13 | 14 | 8 | 3 | 7 | 124 | |
| | 9 | 6 | 6 | 8 | 7 | 10 | 7 | 8 | 11 | 6 | 3 | 6 | 87 | |
| | 1 | 1 | 0 | 4 | 1 | 3 | 6 | 4 | 2 | 2 | 0 | 1 | 25 | |
| | 0 | 0 | 0 | 0 | 2 | 4 | 4 | 1 | 1 | 0 | 0 | 0 | 12 | |
| | 23 | 22 | 26 | 25 | 30 | 34 | 50 | 44 | 34 | 31 | 21 | 24 | 364 | |
| | 14 | 7 | 21 | 9 | 6 | 9 | 17 | 18 | 21 | 23 | 10 | 16 | 171 | |
| | 25 | 18 | 30 | 20 | 21 | 32 | 42 | 31 | 32 | 29 | 19 | 25 | 324 | |
| | 15 | 21 | 23 | 16 | 29 | 19 | 34 | 35 | 25 | 27 | 17 | 21 | 282 | |
| | Distribution after adjustment to month of onset | | | | | | | | | | | | | |
| | First bloods..... | 64 | 60 | 78 | 73 | 77 | 78 | 85 | 83 | 70 | 88 | 52 | 74 | 882 |
| | All diagnoses..... | 36 | 30 | 44 | 42 | 29 | 39 | 67 | 62 | 52 | 59 | 31 | 44 | 535 |
| | Total isolations..... | 10 | 5 | 14 | 16 | 11 | 17 | 7 | 15 | 13 | 5 | 5 | 6 | 124 |

¹ With at least some titer at 1:40.

² No month recorded for 2 specimens.

³ Slaughtering, butchering, processing.

curately, and that symptoms may change with different stages of disease, the symptoms recorded for each patient are summarized in table 2 as a percentage of the 581 patients of known age and sex in the group of 667 patients for whom the doctor replied.

Weakness was the most common symptom, regardless of age, sex, chronicity of illness, or isolation of *Brucella*. Females had far fewer night sweats than did males. Females with confirmed cases of brucellosis had more chills, headache, splenomegaly, abdominal tenderness, rheumatism, and arthritis than females with diagnosed cases; however, none of the latter differences were statistically significant.

Since the data were collected by mail, it was interesting to see whether the cases recorded as acute showed any easily identifiable differences in symptoms from the cases recorded as chronic. The excess of symptoms in acute cases over the symptoms in chronic cases is shown for each sex in table 2. The acute cases show significant excesses of evening fever, chills, night sweats, and headache. Females had an excess of backache, abdominal tenderness, and rheumatism. Although splenomegaly was not frequently recorded, it was relatively much more common in the acute cases. In seeming contradiction, in the confirmed cases, splenomegaly was recorded with *B. abortus* only.

Combinations of symptoms were examined

in an effort to determine whether any groupings might be designated as pathognomic of the disease, as reported in this study. None were found. The number of patients with the five-symptom combination of weakness, chills, night sweats, headache, and backache, with or without other symptoms, was found to exceed the expected number to a significant degree. Even so, only a third of the patients met the five-symptom criterion. Consideration of the influences of titer, sex, and chronicity might reveal a better combination of symptoms, but the complexity of such an analysis was beyond the scope of this paper.

Laboratory Findings

In the beginning, the only serums included in the study were those with at least some agglutination at 1:80, using Lederle's standard *Brucella* antigen and the Huddleson slide method. Later, during the period of research on culture methods, blood specimens with lower titers were investigated.

In the third of the patients who had more than one blood specimen with a positive titer, all possible combinations of shifts in titer occurred. Titers tended to be a little lower for cases of long duration, although complete agglutination at titers of 1:320 or above occurred with durations of 10 years or more. Of

Table 2. Major groupings of patients with the percentages reported as having each listed symptom

| Symptom | Total persons with a doctor's report includ- ing age and sex | | Comparison of doctor's diag- noses of acute and chronic brucellosis | | | | Excess of acute over chronic percentages | | Patients from whom <i>Brucella</i> species were isolated | |
|--------------------------------|--|--------|---|---------|--------|---------|--|--------|---|--------|
| | | | Male | | Female | | | | | |
| | Male | Female | Acute | Chronic | Acute | Chronic | Male | Female | Male | Female |
| Number of patients... | 451 | 130 | 294 | 120 | 70 | 48 | ----- | ----- | 92 | 16 |
| Weakness | 84.6 | 83.1 | 90.8 | 80.8 | 87.1 | 85.4 | 10.0 | 1.7 | 84.8 | 87.5 |
| Evening rise in temperature... | 71.7 | 70.0 | 84.0 | 47.5 | 78.5 | 47.9 | 36.5 | 30.6 | 82.6 | 81.2 |
| Chills..... | 69.0 | 60.8 | 85.7 | 46.7 | 81.4 | 35.4 | 39.0 | 46.0 | 73.9 | 81.2 |
| Night sweats..... | 66.4 | 40.0 | 82.0 | 47.5 | 55.7 | 25.0 | 34.5 | 30.7 | 75.0 | 43.8 |
| Headache..... | 68.4 | 68.5 | 82.0 | 56.7 | 78.5 | 62.5 | 25.3 | 16.0 | 73.9 | 81.2 |
| Loss of weight..... | 50.4 | 42.3 | 60.5 | 46.7 | 45.7 | 41.7 | 13.8 | 4.0 | 65.2 | 50.0 |
| Backache..... | 54.6 | 56.9 | 57.8 | 55.8 | 67.1 | 47.9 | 2.0 | 19.2 | 48.9 | 56.2 |
| Splenomegaly..... | 8.0 | 9.2 | 10.9 | 5.0 | 12.9 | 2.1 | 5.9 | 10.8 | 13.1 | 25.0 |
| Abdominal tenderness..... | 22.9 | 31.5 | 24.5 | 25.0 | 42.8 | 22.0 | — .5 | 19.9 | 23.0 | 43.8 |
| Rheumatism..... | 27.8 | 36.9 | 28.2 | 26.7 | 35.7 | 22.0 | 1.5 | 12.8 | 29.3 | 43.8 |
| Arthritis..... | 17.1 | 19.2 | 17.7 | 20.8 | 22.8 | 25.0 | — 3.1 | — 2.2 | 16.3 | 31.2 |
| Anemia..... | 18.0 | 27.7 | 20.4 | 23.3 | 28.6 | 31.2 | — 2.9 | — 2.6 | 22.8 | 31.2 |

Table 3. Probability of isolation of *Brucella* from blood clots, for each agglutination titer

| Titer level | Number of isolations | Probability | 95.5 percent confidence limits | |
|-------------------------|----------------------|-------------|--------------------------------|-------|
| | | | Upper | Lower |
| 0..... | 3 | 0.0004 | ----- | ----- |
| 1:40 ¹ | 34 | .098 | 0.130 | 0.066 |
| 1:80..... | 35 | .141 | .185 | .097 |
| 1:160..... | 29 | .171 | .229 | .113 |
| 1:320..... | 11 | .157 | .244 | .070 |
| 1:640..... | 8 | .253 | .415 | .101 |
| 1:1,280..... | 4 | .286 | .528 | .0 |

¹ Includes incomplete agglutinations at this titer.

course, there is always the possibility of re-infection.

These data clearly demonstrate a relation between titer and probability of isolation of *Brucella* even though the quantitative values cannot be assumed to provide a standard. Some one species of *Brucella* was found in the

blood samples of 124 of the 884 persons in the study (table 1). The population estimate for the negative blood specimens was 7,393 (5). The probability of making an isolation starts at 0.0004 for negative blood samples, is 0.10 for a titer of 1:40, rises to 0.17 for 1:160, and reaches 0.29 for 1:1,280, the highest dilution tested (table 3). Due to the decrease in numbers of specimens with increase in titer, the confidence limits of this relation are broad at the higher titers.

Although there was no strong correlation between blood titer and isolation of organisms, titers accompanied by isolation were higher for specimens taken 2 to 4 months after onset of illness than for those taken during the month of onset or the first month afterward. During the month of onset, titers for *B. suis* were definitely higher than titers for other species. Acute brucellosis was associated with a higher average titer than chronic brucellosis, but both ran the full range of titers.

Table 4. Seasonal distributions in various classifications of patients

| Classification | Month | | | | | | | | | | | | |
|---|-------|------|------|------|------|------|------|------|-------|------|------|------|--------------------|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
| Distribution before adjustment | | | | | | | | | | | | | |
| Specimens submitted: ¹ | | | | | | | | | | | | | |
| All blood specimens----- | 93 | 85 | 110 | 86 | 99 | 108 | 137 | 144 | 121 | 141 | 83 | 110 | ² 1,317 |
| First bloods only: | | | | | | | | | | | | | |
| Number----- | 65 | 55 | 81 | 60 | 72 | 74 | 98 | 94 | 76 | 86 | 51 | 70 | ² 882 |
| Geometric mean titer----- | 1:92 | 1:76 | 1:72 | 1:82 | 1:88 | 1:90 | 1:78 | 1:80 | 1:90 | 1:98 | 1:94 | 1:89 | |
| Isolations of <i>Brucella</i> : | | | | | | | | | | | | | |
| Total----- | 10 | 7 | 6 | 12 | 10 | 17 | 17 | 13 | 14 | 8 | 3 | 7 | 124 |
| <i>B. abortus</i> ----- | 9 | 6 | 6 | 8 | 7 | 10 | 7 | 8 | 11 | 6 | 3 | 6 | 87 |
| <i>B. suis</i> ----- | 1 | 1 | 0 | 4 | 1 | 3 | 6 | 4 | 2 | 2 | 0 | 1 | 25 |
| <i>B. melitensis</i> ----- | 0 | 0 | 0 | 0 | 2 | 4 | 4 | 1 | 1 | 0 | 0 | 0 | 12 |
| Brucellosis diagnosed by physician: | | | | | | | | | | | | | |
| Acute----- | 23 | 22 | 26 | 25 | 30 | 34 | 50 | 44 | 34 | 31 | 21 | 24 | 364 |
| Chronic----- | 14 | 7 | 21 | 9 | 6 | 9 | 17 | 18 | 21 | 23 | 10 | 16 | 171 |
| History of animal contact: ³ | | | | | | | | | | | | | |
| Any recorded contact----- | 25 | 18 | 30 | 20 | 21 | 32 | 42 | 31 | 32 | 29 | 19 | 25 | 324 |
| No recorded contact----- | 15 | 21 | 23 | 16 | 29 | 19 | 34 | 35 | 25 | 27 | 17 | 21 | 282 |
| Distribution after adjustment to month of onset | | | | | | | | | | | | | |
| First bloods----- | 64 | 60 | 78 | 73 | 77 | 78 | 85 | 83 | 70 | 88 | 52 | 74 | 882 |
| All diagnoses----- | 36 | 30 | 44 | 42 | 29 | 39 | 67 | 62 | 52 | 59 | 31 | 44 | 535 |
| Total isolations----- | 10 | 5 | 14 | 16 | 11 | 17 | 7 | 15 | 13 | 5 | 5 | 6 | 124 |

¹ With at least some titer at 1:40.

² No month recorded for 2 specimens.

³ Slaughtering, butchering, processing.

Seasonal Distribution

The frequency of positive agglutination tests showed low peaks in December and March, with a high incidence in July–October (table 4). The geometric mean titer does not fit the curve of number of tests, isolations, or number of diagnosed cases. Expected numbers of isolations, calculated for each month on the basis of probabilities by titers, as shown in table 3, fell short of the observed 83 isolations for April–September by 18, a very significant deficit. These 6 months were responsible for 32 of the 37 isolations of *B. suis* and *B. melitensis* and for 51 of the 87 *B. abortus*. The diagnosis of chronic brucellosis had modes in March, September, and October, whereas acute brucellosis showed excesses in May–October, with modes in July–August. There was a significant disproportionality between the number of persons with and without animal contact only in the month of May. When the figures were adjusted to month of onset, insofar as possible, some minor shifts occurred. The only shift worth noting is the increase in isolations from 6 to 14 in March, 5 attributed to *B. suis* and 3 to *B. abortus*.

Possible Sources of Infection

The major possibilities of exposure to brucellosis, shown in table 5, are based on the 596 reports returned by persons whose blood was tested in the State serology laboratory and found positive at some titer. Adequately classified population groups cannot be enumerated to permit a calculation of specific attack rates.

Within this study, it is possible to examine the proportions of patients whose blood is culturally positive when classed by various possible methods of exposure. The results do not indicate the risk of exposure, although they could be an index of the amount or method of exposure. Also, the more severely afflicted persons may have been more likely to answer the questionnaire than persons less severely afflicted.

The gross rate of recovery or isolation of *Brucella* was 16.9 per 100 for the 596 patients who returned a questionnaire and 8.0 for the 288 who did not. The difference between the

Table 5. Major classifications of exposure and rates of isolation of *Brucella* species in study population

| Exposure classification | Total persons | Rate of recovery of <i>Brucella</i> in exposure group/100 | |
|--|---------------|---|-------------------|
| | | <i>B. abortus</i> only | All 3 species |
| Total persons with any exposure information----- | 596 | 11.7 | 16.9 |
| Remainder----- | 288 | ² 5.9 | ² 8.0 |
| Packinghouse workers ¹ ----- | 9 | 0 | 100.0 |
| Total with definite milk status----- | 537 | 11.7 | 16.6 |
| Male----- | 413 | 13.1 | 18.4 |
| Female----- | 124 | ² 7.3 | ² 10.5 |
| Males: | | | |
| Meat contact ³ ----- | 230 | 13.9 | 20.0 |
| Farm contact ⁴ ----- | 322 | 13.7 | 17.4 |
| Raw milk used----- | 349 | 13.2 | 16.9 |
| Meat and milk----- | 197 | 14.7 | 18.8 |
| Farm and milk----- | 288 | 13.2 | 16.3 |
| Meat and farm----- | 194 | 15.5 | 19.1 |
| Meat, milk, and farm----- | 177 | 15.3 | 18.6 |
| Females: | | | |
| Meat contact----- | 69 | 11.6 | 17.4 |
| Farm contact----- | 70 | 8.6 | 12.8 |
| Raw milk used----- | 107 | 7.5 | 10.3 |
| Meat and milk----- | 64 | 12.5 | 17.2 |
| Farm and milk----- | 64 | 9.4 | 12.5 |
| Meat and farm----- | 55 | 10.9 | 16.4 |
| Meat, milk, and farm----- | 52 | 11.5 | 15.4 |

¹ 6 included in subsequent groups.

² Rates are highly significantly lower than line above.

³ Any contact with carcass or meat—slaughtering, butchering, processing.

⁴ Farmers, farm residents, farm laborers.

two rates is highly significant. The rate for females was lower than the rate for males to a highly significant degree. The packinghouse workers had a perfect record of 9 for 9. Exclusive of this 9, persons with butchering or meat processing exposure had a rate of 17.5. In both males and females, the record of contact with any meat or carcass was associated with a higher rate of recovery of *Brucella* than records of other exposures. There was no evidence that the use of raw milk products was associated with a higher rate of recovery of organisms than meat or farm contacts. In fact, the 81 persons who stated that they did not use raw milk had the same rate of recovery of *B. abortus* and a higher rate for all species than the users of raw milk.

Opportunities for exposure to *Brucella* were ubiquitous; no single type of contact can be

incriminated. The number of males with farm and meat contacts and the number of females with no farm contact exceeded the numbers expected. Contacts with meat and milk were closely associated with farm contact, which, simply put, indicates that rural activities offer the greatest opportunity for exposure to *Brucella*.

Duration, Incidence, and Prevalence

The distribution of months of duration since onset of illness may be based on two sources. First, at the time of entering the survey, 24.5 percent of the patients had records of duration of illness of 12 months or longer, and 6.3 percent had recorded durations of 5 years or more (table 6). Second, if the 884 persons in the study population had remained in the study for a full 5 years, an estimated 73 persons (8.3 percent) would have re-entered the study after 1 and under 5 years.

Table 6. Distribution of recorded duration of brucellosis upon entry to the study

| Recorded duration | Frequency | Percent |
|-------------------|-----------|---------|
| Months: | | |
| 0-3---- | 370 | 63.5 |
| 4-11---- | 70 | 12.0 |
| Years: | | |
| 1----- | 45 | 7.7 |
| 2----- | 29 | 5.0 |
| 3----- | 17 | 2.9 |
| 4----- | 15 | 2.6 |
| 5----- | 11 | 1.9 |
| 6-10---- | 16 | 2.7 |
| 11-20---- | 10 | 1.7 |

The percentage of the study population in each duration interval provided a base for an estimate of the probability of a return case of brucellosis. Using the number of previously reported cases in the United States as a population, an estimate was made of the number of return cases to be expected. In 1950, reported cases of brucellosis in the United States numbered 3,510, and the estimated number of return cases is 2,257; in 1955, the figures were 1,232 and 1,875, respectively. The estimate for 1960 is 443 reported cases and 1,314 return cases.

Data on reported cases of brucellosis for the United States as a whole are not restricted to new cases, but under-reporting more than balances the confusion between prevalence and incidence. For instance, from these data physicians reported a diagnosis of brucellosis in 535 cases, whereas only 437 cases were reported officially to the Indiana State Board of Health. State records were unavailable for comparison of names, but a comparison of the two sets of records by county and year showed that only 263 cases coincided, making a minimum of 709 diagnosed cases of brucellosis in Indiana, during the period 1946-50.

Discussion

The data in this paper provide information on brucellosis in an essentially rural population and probably are deficient concerning urban populations in occupations which present opportunity for exposure to brucellosis through contact with animals. One unique feature of the study is the reply by 85 percent of those who answered questionnaires that they used raw milk or raw milk products. In a similar study in Iowa, only 55 percent of the study population reported use of raw milk or raw milk products (6). In this study, even among persons with no known animal or farm contacts, 76 percent were users of raw milk, in contrast with the 56 percent reported in Wisconsin (7). While the noncontact cases approached a 1:1 sex ratio in the use of raw milk, all isolations of *B. abortus* occurred in males, in contrast to Minnesota data (8), which gave a 1:1 ratio between noncontact cases with isolation.

Laboratory data, lending support or confirmation to the clinical picture, often are considered indispensable to the final diagnosis of brucellosis. However, the sources of variability in laboratory results are numerous. These data show that any observed titer for a given person's blood represented a quite transitory condition and might exhibit any pattern of changes over a short or an extended period of time. The changes, or lack of changes, in titer could not be related to other attributes in the study. Original isolations followed by later tests, with or without isola-

tion of *Brucella*, showed no change in titer in 11 individuals, rises in titer in 21, and decline in titer in 13. There were no differences in titer between species. Titer was not a strong influence in the differential diagnosis of chronic and acute brucellosis.

Magoffin and others, using a tube method and BAI antigen, found titers of 1:320 or greater in over 90 percent of 267 culturally proved cases of brucellosis in Minnesota (8). The frequency distributions of titers in Indiana and in Minnesota were similar but in Minnesota the titers were approximately 5 dilutions higher, or 32 times as dilute, as in Indiana. The methods in the two States differed, but it is likely that the Indiana study of culture methods revealed positives at truly lower titers. *B. abortus* was predominant in both surveys, Minnesota had more *B. melitensis*, and Indiana had more *B. suis*.

In this study, one of each of the three species of *Brucella* was found in blood specimens with no agglutination titer. The chances of recovering the organism increased as the titer increased. Damon and co-workers, using most of the same blood specimens reported on here, found that the method of culturing also was important in the number of recoveries of *Brucella* (1). The yolk sac technique was twice as effective as C-V broth, which in turn was definitely superior to the best guinea pig method. Research on the yolk sac method lasted only long enough to isolate 14 strains of *Brucella*, so it is entirely possible that well over 200 isolations could have been made instead of 139 if the yolk sac culture method had been used throughout the study.

Contrary to the observation of Gay and Damon (4), 15 *B. abortus*, 3 *B. suis*, and 1 *B. melitensis* were isolated from patients with a diagnosis of chronic brucellosis. In 9 cases, however, the reported duration of illness was less than 12 months. Two cases, one with isolation of *B. abortus* and one with isolation of *B. suis*, had initial diagnoses of acute brucellosis, but later in the study the disease was diagnosed as chronic. Another case had a positive blood titer 19 months before the isolation of *B. suis*, with the diagnosis of chronic brucellosis and a total recorded duration of illness of 43 months. Still another had two iso-

lations of *B. suis* 6 months apart, with respective diagnoses of acute and chronic brucellosis. This also was the longest recorded interval between successive isolations.

In Iowa, Hendricks has shown a closely similar pattern between the seasonal distribution of cases of brucellosis in male farm workers and the incidence of sows farrowing (6). In Indiana, the incidence of brucellosis in man did not parallel the farrowing curve of sows. These differences are not unexpected since the swine industries of Iowa and Indiana are considerably different in relation to total livestock.

Information on brucellosis from 16 other States was examined for comparison of data on age and sex. Most of the data were for 1949. In that year, the ratio of males to females varied from 0.8 in Washington and 0.9 in Kentucky to 4.9 in Minnesota and 4.8 in North Dakota. The 3.5 ratio for Indiana was intermediate. In Iowa and Minnesota, the ratio of males to females increased with time but decreased in Washington and remained constant in Wisconsin. In Minnesota, a recent decrease in brucellosis cases among females caused the increase in ratio of males to females. Data from Iowa for 1949 and 1952-53 indicate increases in the proportions of packinghouse workers and workers in related industries who have brucellosis, and decreases in the proportions of children and housewives who have the disease. Hendricks confirms this observation (6).

Age and sex data were supplied by the health departments of the following States:

| | |
|-------------|--------------|
| Connecticut | North Dakota |
| Colorado | Ohio |
| Illinois | Oregon |
| Iowa | Tennessee |
| Kentucky | Vermont |
| Michigan | Virginia |
| Minnesota | Washington |
| New York | Wisconsin |

Data for the same 16 States showed that where the ratio of males to females was high, the difference was apparent by the age of 5-9, was most marked in young adulthood, and decreased with age, in agreement with Feig (7) and with the Indiana data. Shifts in the age of brucellosis patients in Iowa and Wisconsin from one year to the next would make one sus-

pect that similar variations from State to State could have little epidemiological value.

Since brucellosis is reported to be transmitted rarely from man to man, age and sex distribution is largely a reflection of the occupations of the patients, of the general economy, and of the distribution of the disease in animals, peculiar to geography and time. Biases in reporting will contribute to differences in incidence of brucellosis between States. We may expect, on these bases, that epidemiological information will be peculiar to a State and will be influenced by the year of occurrence of reported cases.

Data from other States are compatible with the finding in this study of 25 percent of patients with recorded durations of brucellosis longer than a year. Spink and Magoffin observed a group of 185 patients whose infections were severe enough to require hospitalization (9). Of 65 untreated persons, nearly half had subjective symptoms after a year but only an eighth still had disability. Giedt reported that 51 percent of the reported cases of brucellosis in Washington in 1950 had durations of 1 year or longer, and 11 percent had durations of 5 years or more (10). Corresponding data for 1945-47 were 24 percent and 7.5 percent. Eisele has shown that a majority of patients have prompt remissions with several antibiotic regimens, but that relapse is all too common (11). Other investigators have arrived at the same essential conclusion: No sure cure for brucellosis has been discovered. Feig pointed to the use of antibiotics as one factor in the decrease of reported brucellosis, through symptomatic treatment without differential diagnosis (7).

These observations place considerable importance on differentiating between the new cases of brucellosis and relapse, exacerbation, or reinfection, in assessing the significance of the brucellosis problem in the immediate future.

Summary

During the 5-year period 1946-50, the Indiana State Board of Health laboratory performed 35,683 slide agglutination tests for *Brucella*. Incomplete reaction at 1:40 was noted in 1,998 blood specimens, and 838

showed complete agglutination at 1:40 or higher. Mailed questionnaires sought additional information from 884 patients and their doctors. The descriptive statistics: 674 males, age range 2-74, mean 39.2, modes 29, 30, 40 years; 210 females, age range 6-77, mean 37.3, modes 24, 26 years; 364 diagnosed acute, 171 chronic; 87 *Brucella abortus*, 25 *Brucella suis*, and 12 *Brucella melitensis* isolations; average recorded duration 12.6 months, 9.7 for males and 22.3 for females; 24.5 percent with recorded duration 12 months or longer, 6.3 percent with 5 years or more. The probability of isolation was directly related to titer being 0.1 for 1:40 and 0.29 for 1:1,280 or over.

Major classes of occupation-contact for 596 persons were: 456 used raw milk, 81 did not; 317 butchered or processed meat for home use; 423 resided on farms or had farm contacts; 27 were packinghouse workers or commercial butchers.

The most common recorded symptom was weakness. The most prominent combination of five symptoms was weakness, chills, night sweats, headache, and backache. Fever, chills, night sweats, and headache were much more common in patients with acute brucellosis. Females had significantly fewer night sweats than males, but more backaches, abdominal tenderness, and rheumatism.

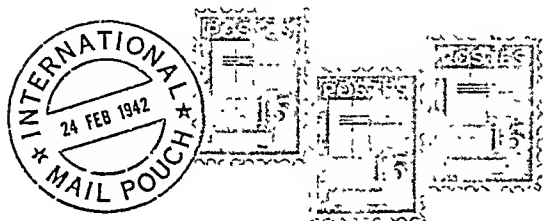
There were more tests, isolations, and diagnoses in July-October, with secondary peaks in December and March-April. Large numbers of cases were found in areas with large swine populations.

If recorded durations of cases are reliable and representative, the prevalence of brucellosis in the United States in 1955 should have been over twice the incidence, and, with present trends, prevalence in 1960 will exceed four times the incidence.

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National Health Congress

The first National Health Congress of Vietnam, sponsored by the Ministry of Health, was held in April 1956. Each province was represented. More than 100 physicians, as many health service personnel, and members of national and international organizations attended. Leading pharmaceutical companies of Vietnam displayed educational exhibits of modern drugs. The well-chosen exhibits attracted the attention of physicians and laymen alike.

—HARRY H. STAGE, *acting chief, Health and Sanitation Division, United States Operations Mission, Vietnam.*

Pan Brazilian Textbook

Thirty-one teachers and three sanitary engineers have volunteered to contribute 38 chapters to a Pan Brazilian textbook on water supply and sewerage, and have completed about half of the text.

The book is being written by Brazilians, for Brazilians, to fit Brazilian conditions. Authors represent engineering colleges, from the Amazon to

Rio Grande do Sul, as well as sanitary engineers in government employ. The project will produce a textbook in the Portuguese language for engineering students, point the way to textbooks in other fields, create uniform Brazilian technical standards and nomenclature, attract the attention of educators and others to the needs of sanitary engineering education, and improve the morale and methods of sanitary engineering instructors.

—E. ROSS JENNY, M.D., *chief, Health and Sanitation Division, United States Operations Mission, Brazil.*

Monuments

The requirement that all structures built with point 4 funds have a permanent identification created a problem. Any permanent marker would have been too costly for the 1,500 pit privies we had helped build, and for the 10,000 more anticipated, at an average cost of about \$15.

We discussed the matter with owners of the privies. One proud owner suggested that since the privies have concrete floor slabs and brick superstructures, permanent imprints could be stamped in the floor slab or one of the bricks as the parts are made. The idea sounded so good that we have had a form of the emblem and other necessary materials prepared. Each structure will have its permanent marker at negligible cost.

—ARTHUR L. DOPMEYER, *formerly acting chief, Technical Service for Health and Sanitation, United States Operations Mission, Jordan.*

Addressing Machine Used In Epidemiological Study

JOSEPH W. COOCH, M.D.

MACHINE records of various types have been used in large-scale epidemiological studies for many years. The use of addressing equipment for this purpose, however, is less common.

At Fort Dix, N. J., an addressing machine (A) was used to prepare rosters, file cards, and labels, in a large-scale study of the effectiveness of gamma globulin against acute respiratory disease. This technique, efficient and accurate, may prove useful in various types of epidemiological studies.

The Fort Dix study, carried out during the winter of 1954-55, was designed to determine whether gamma globulin had either prophylactic or therapeutic effect against acute respiratory disease. Participants were divided into two groups, one to receive prophylactic gamma globulin and the other to receive a control substance. Records of hospital admissions for respiratory illness were kept for comparison of incidence in the two groups. Alternate patients were given therapeutic doses of gamma globulin, and the others received injections of another control material. For these subgroups, duration of hospital stay was used to evaluate gamma globulin effectiveness.

As plans for the study progressed, the need for short cuts to expedite clerical work and assure accuracy of records became evident. One technique adopted was the use of an addressing machine for reproducing data identifying the participants. An addressing machine and a graphotype embossing machine with various accessories were available, and it was planned to cut plates for each individual in the study. It was learned, however, that address plates were prepared for each Army inductee by the reception station at the camp

and then destroyed after rosters were made. These plates were made available to the research team.

The address plates were picked up daily, together with copies of orders assigning the men to a training company. When plates for a full company were available, they were arranged at random. The original roster number of each plate was effaced and a project number of four digits was added. Project numbers began with 0001 for the first name in the first company and continued in sequence for each subsequent company. Each plate then contained the serviceman's name, Army service number, rank, date of birth, race, and project number.

From these modified plates, appropriate rosters, file cards, individual worksheets, and adhesive tape labels for blood specimens were prepared on the addressing machine. One file drawer holds 200 address plates, almost enough for a full company of men, and can be fed into the machine to run off a roster in 3 or 4 minutes. The adhesive tape labels were made by putting strips of 4-inch adhesive tape on old X-ray film and running this through the imprinter.

Three sets of file cards were made. One was kept in the dispensary, where dates of sick call visits were recorded. A second was kept in the hospital admission office, where dates of hospital admissions were recorded. A third, or master file, was maintained in the medical research office, where dates of inoculation, taking of subsequent blood samples, sick call visits, and hospitalizations were all recorded. All data were recorded on a worksheet for each individual in the study. These worksheets were sent to the laboratory for addition of laboratory findings and then to a consulting statistician for completion and discussion of the data.

Handling of demographic data obtained over an extended period of time from a population which is fluctuating in size and undergoing several complete turnovers is never easy. It is especially difficult when much of the information must be compiled by inexperienced personnel. Preparation of long rosters may require many hours of work, and great care must be exercised to avoid mistakes.

The use of addressing equipment is one

Lieutenant Colonel Cooch, in the Medical Corps of the U. S. Army, is chief of the health center at Fort Dix, N. J.

method of doing the job with speed and accuracy. A roster for 200 people can be prepared by relatively untrained personnel in less than 5 minutes. With small adjustments in the machine, rosters can include any or all of the data from each plate.

Preparation of the plates is likewise easy. Although plates already cut were used in the study described here, we have found in subsequent studies that it is easier to prepare new plates than to use the old ones. Persons with no previous training can be taught to operate the embossing machine with an hour's instruction. They become proficient in a day or two.

There are definite limitations to the use of this type of equipment. If there is a great number of subjects, storage of plates poses a problem. The number of items that can be

recorded for each individual and the number of variables that can be measured are limited. However, a tabbing system will extend the usefulness of the plates. The tabs permit selection by the machine of plates with the data desired, enabling both counts and printed rosters to be made in one operation.

Though addressing equipment is not adaptable to every type of study, it can be used to advantage in studies involving references to lists, card sorts, label preparation, item duplications, and the like for as many as 20,000 individuals.

EQUIPMENT REFERENCE

- (A) Addressograph machine, Addressograph-Multi-graph Corporation, 1200 Babbitt Rd., Cleveland, Ohio.

technical publications

Control of Radon and Daughters in Uranium Mines and Calculations on Biologic Effects

PHS Publication No. 494. 1957. By Duncan A. Holaday, David E. Rushing, Richard D. Coleman, Paul F. Woolrich, Howard L. Kusnetz, and William F. Bale. 89 pages.

Through a long-range study, the Public Health Service seeks to define the effects of uranium mining operations on the health of the miners and to derive data leading to the establishment of a healthful working environment.

Although no evidence of health damage has been found among American miners, the European experience points to possible serious health effects. As a preventive measure, early in the industry's growth, the Public Health Service recommended steps to safeguard the health of the miners.

This technical bulletin describes the results of the environmental study to date, together with the work of other investigators, with reference to methods of measuring atmospheric concentrations of radon and daughter products, the establishment of a safe working level for radon daughter products, and the development of effective control measures.

The material is designed for use by the industry and others in evaluating health hazards and in deriving economically feasible control methods.

The Communicable Disease Center

PHS Publication No. 491. 1957. 25 pages; illustrated.

Not an annual report, this pictorial brochure provides an easily read introduction to the communicable disease problem and to the ac-

tivities of the Communicable Disease Center, Bureau of State Services, Public Health Service.

The pamphlet shows the extent of the communicable disease problem in the United States. It gives the history and mission of the CDC and tells how CDC helps to carry out the Federal Government's responsibility for communicable disease control through epidemic and disaster aid, studies, consultation, demonstrations, and training.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEROY E. BURNEY, *Surgeon General*

This interim report on prophylaxis of rabies in man reviews briefly the development of experimental studies with laboratory animals and presents results to date of tests of such experimental methods applied to man.

Rabies Prophylaxis in Man

KARL HABEL, M.D.

IN GENERAL, research in rabies prophylaxis has developed along two lines. One has been aimed at improving the effectiveness of rabies prophylaxis in man; the other has been concerned with methods of reducing the severity of reactions to vaccine prophylaxis, especially reactions of the dangerous neurological type.

Efforts to improve the efficacy of prophylaxis were stimulated by the demonstrated failure of vaccine in preventing rabies after severe exposure. Experience in Middle East countries, such as Iran, showed that persons severely bitten by rabid wolves developed rabies at the same high rate (40 percent) whether given a full course of potent vaccine or no treatment (1). Research in recent years has centered on the use of rabies antiserum as an adjunct to vaccine. In laboratory experiments with modern quantitative techniques, antiserum alone gave better results against experimental infection than vaccine alone; furthermore, antiserum alone tended to prolong markedly the incubation period. Best protection was obtained when antiserum was used together with a course of vaccine (2, 3).

Dr. Habel is chief of the Section on Basic Studies, National Institute of Allergy and Infectious Diseases, Public Health Service. He presented this paper at the annual meeting of the American Public Health Association, November 1956, Atlantic City, N. J.

In order to determine whether doses of vaccine and antiserum practical for use in man would give similar results, the World Health Organization's Expert Committee on Rabies set up two studies. The first study observed effects on normal human volunteers given various schedules of vaccine either exclusively or combined with a single dose of antiserum. Evaluation of efficacy was based on the serum neutralizing antibody titers developing in the blood of the volunteers at various intervals during and after the course of immunization. A summary of some of the results of this experiment, the details of which have been published by WHO (4), is given in figures 1 and 2. Ten persons were observed in each treatment group, and the points on the graph represent the average serum titers of the 10 patients at the specified number of days from the start of treatment.

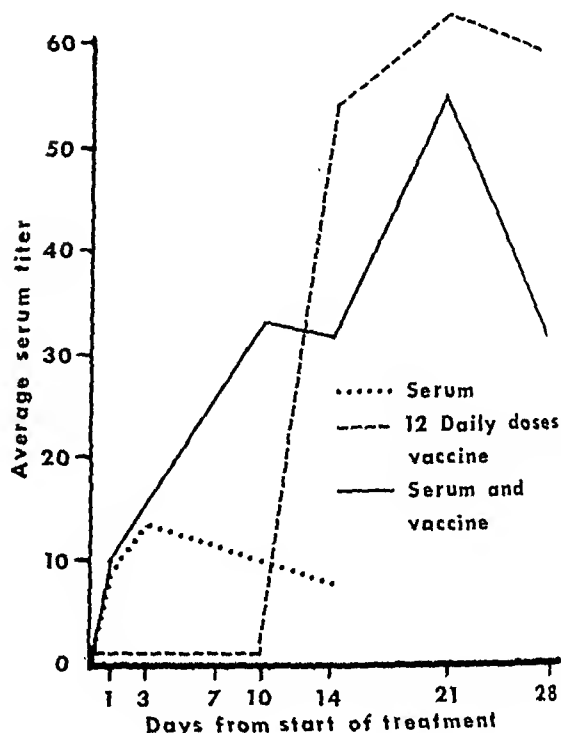
In figure 1 it can be seen that the individuals receiving serum alone in the form of a single injection of antirabies rabbit serum had demonstrable antibody 1 day later; the antibody gradually decreased in titer to the 14th day. The group receiving 7 daily doses of vaccine showed first evidence of antibody response at 10 days, but significant levels did not appear until the 14th day and then persisted. However, if antiserum was given 1 day before the start of vaccine, the pattern of antibody level was similar to that in the group which

received serum alone, and there was no evidence of an active antibody response to the vaccine after the 14th day.

Figure 2 shows comparative results when 12 daily doses of vaccine were given. Again, active antibody production due to vaccine alone was not apparent until the 14th day. It was quantitatively higher than after only 7 doses, and it persisted throughout the 28-day period. Here the combination of that same schedule of vaccine with a single dose of serum gave a significant antibody level early because of the passive immunization with antiserum and late because of active immunization with the vaccine.

These experiments and others indicate that there is some interference with the antigenic effect of relatively low doses of vaccine when serum antibody is given early, but this inhibition can be overcome if more vaccine is given over a longer period of time. On the other hand there was no evidence that the vaccination neutralized the antibody in the passively administered antiserum. Obviously, figure 2 shows the type of response in which we are interested. We would like to have antibody

Figure 2. Comparison of neutralizing antibody response of human volunteers to rabies antiserum alone, 12 daily vaccine doses, and combined treatment.



SOURCE: Reference 4.

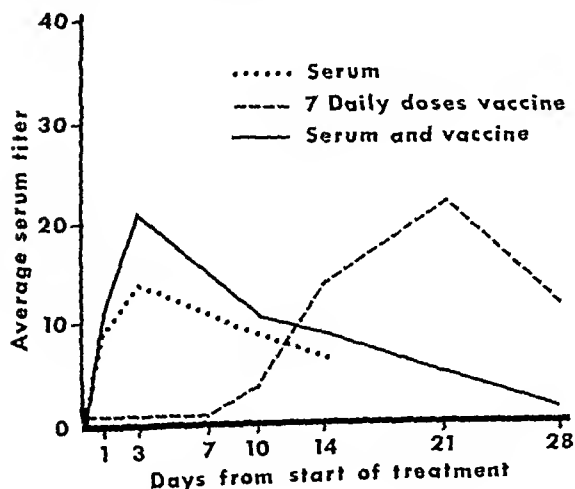
NOTE: Each point on the chart represents the average antibody levels of 10 persons and is the reciprocal of the serum dilution which neutralizes 32 LD₅₀ of virus.

present throughout the course of treatment: antibody introduced early by the antiserum that is given passively; antibody produced late by the active response of the individual to the vaccine.

Field Test in Iran

The second study set up by the WHO Expert Committee on Rabies for the use of antiserum in man was an actual field test in exposed individuals. Because of past experience of vaccine failures in prophylaxis following bites by rabid wolves in Iran, test arrangements were made with Dr. M. Baltazard at the Pasteur Institute in Teheran. Groups of individuals subsequently exposed were to be divided into treatment groups so that comparable exposures could be treated either with vaccine alone or

Figure 1. Comparison of neutralizing antibody response of human volunteers to rabies antiserum alone, 7 daily doses of vaccine, and combined treatment.



SOURCE: Reference 4.

NOTE: Each point on the chart represents the average antibody levels of 10 persons and is the reciprocal of the serum dilution which neutralizes 32 LD₅₀ of virus.

with vaccine plus antiserum. As frequently happens no such group of exposed individuals became available for some time. When they did more than 3 years later, the local physician was not aware that the bites represented exposure to rabies since the wolf was not apprehended. No treatment was administered until the 20th day when the first of the 17 bitten individuals developed rabies. Although vaccine treatment of the rest of the group was started at this time, the interval between exposure and treatment was so long that the entire group can be considered as receiving no specific prophylaxis. Forty percent of these individuals died of rabies.

One year later an ideal group presented itself, and the story of the exposure is indeed a dramatic one (5). In August 1954, several busloads of people stopped to spend the night at a small town in the forests some 500 kilometers from Teheran. Because of the heat many bus passengers and townspeople slept outdoors on the ground or on open porches and balconies. At midnight a scream was heard from an orchard on the edge of town because a large wolf had attacked one of the sleeping men. Within a very short time the wolf bit several others in the orchard, circled a bit and entered the center of the village, where he attacked and bit several people on the street. He even entered some homes slashing people asleep on a balcony and proceeded across town attacking more along the main road. The wolf finally bit six cows in a nearby field and was killed

as he lunged at a horse and rider. A total of 29 people, 1 dog, and 6 cows had been bitten during a 5-hour period.

All exposed individuals plus the dead wolf were placed in a commandeered truck and taken to the Pasteur Institute in Teheran, where treatment was started within 30 hours after exposure. The wolf was proved rabid by isolation of rabies virus from his brain. His saliva apparently had been infectious throughout the period of his attack since the first person bitten died of rabies as did two of the cows which were bitten just before the wolf was killed. The patients were divided into treatment groups (table 1). Only the 18 bitten on the head or neck are important in evaluating the treatment results since past experience in Iran had indicated that most rabies deaths occurred after this type of exposure.

A group of 5 patients, 4 of whom had severe bites, were treated with two inoculations of serum given 4 days apart plus a full 21-day course of vaccine; no cases occurred. Another group of 7 patients received one dose of serum on the first day, followed by 21 doses of vaccine; 1 out of the 7 died from rabies. The third group, consisting of 5 individuals, 4 of whom had been severely bitten on the head, received the course of vaccine alone. Of this group, 3 died of rabies. One boy, patient No. 27 listed separately in table 1, was bitten directly through his skull and received practically an intracerebral inoculation of saliva from the rabid wolf. He was unconscious on arrival

Table 1. Mortality of patients bitten by rabid wolf, Iran, 1954

| Group | Number of patients | Number of patients with severe exposure | Location of bites | Treatment | Mortality |
|-----------------------|--------------------|---|----------------------------|---------------------------------------|-----------|
| A..... | 5 | 4 | Head..... | 2 inoculations of serum plus vaccine. | 0/5 |
| B and patient No. 28. | 7 | 7 | Head..... | 1 inoculation of serum plus vaccine. | 1/7 |
| C..... | 5 | 4 | Head..... | Vaccine only. | 3/5 |
| Patient No. 27..... | 1 | 1 | Meninges..... | 6 inoculations of serum plus vaccine. | 0/1 |
| D..... | 4 | 0 | Trunk and extremities..... | 1 inoculation of serum plus vaccine. | 0/4 |
| E and patient No. 29. | 7 | 0 | Trunk and extremities..... | Vaccine only. | 0/7 |

SOURCE: Reference 5.

Table 2. Neutralizing antibody levels in serum samples of group A patients exposed to head and neck bites of rabid wolf and treated with two doses of serum and complete course of vaccine

| Patient No. | Out- come | Antibody titers on days after start of treatment ¹ | | | | | | | | | | | | | | | | |
|-----------------|--------------|---|---|----|-----|----|---|----|-----|----|----|----|----|----|-----|----|----|----|
| | | 1 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 13 | 15 | 19 | 21 | 25 | 29 | 33 | 41 | 53 |
| A1 | S | 8 | + | | 22 | | + | | 22 | | 22 | | 22 | | 5 | | + | 12 |
| A2 | S | 13 | + | | 32 | | + | | 22 | | 22 | | 12 | | 6 | | + | 3 |
| A3 | S | tr | | | 13 | | + | | 66 | | 30 | | 76 | | 191 | | + | 76 |
| A4 | S | tr | + | | | 32 | + | | 22 | | 22 | | 12 | | 6 | | | tr |
| A5 | S | 6 | + | | 112 | | + | | 10 | | 17 | | 22 | | 22 | | + | 8 |
| 27 ² | S | | | 19 | | 38 | | 99 | 112 | 99 | + | 30 | | 32 | | 22 | | |

¹ The figures shown are the reciprocals of the serum dilutions, representing the 50 percent end point in the neutralization test against 8-16 LD₅₀ of virus.

² Patient 27 received 6 injections of serum and a complete course of vaccine.

S=Survived. D=Died of rabies.

+ =Virus neutralized by undiluted serum; no titration of antibodies done.

tr=Partial neutralization of virus at a dilution of less than 1:5 of serum.

SOURCE: Reference 6.

at the Pasteur Institute. Because of his severe exposure, he was given not only the course of vaccine but also a dose of serum on alternate days for 6 doses. That boy also survived. The other cases listed at the bottom of table 1 are not significant because they were bitten elsewhere than on the head, and we know that even without treatment most of them probably would have survived.

Dr. Hilary Koprowski and I received the serums from all these patients (blood samples were taken at intervals for a period of 50 days by the group in Teheran), and quantitative neutralization tests for rabies antibodies were run on certain of the samples (6). Group A, which received 2 doses of serum plus a course of vaccine, showed no antibody, of course, before treatment. Antibody was demonstrated on the first day and persisted at good levels on the 5th and the 10th days. In serum specimens collected at later periods when antibody is not expected to persist, we found that these individuals were developing active antibody as a result of the vaccine. All of these people survived; all of them had antibody (table 2).

In group B, which received only one dose of serum plus a course of vaccine, the one person who died of rabies showed no active antibody response to the vaccine although he had shown antibody levels early after the inoculation of antiserum (table 3).

Of the 5 patients in the control group, which

received vaccine only, 3 died of rabies (table 4). There seems to be very little or no correlation between the amount of antibody produced by the active immunization and the subsequent outcome of the disease. One patient who died had no antibody at any time, yet another with fatal outcome had an excellent antibody response. Of course, we have to remember that the antigen of the street virus introduced by the rabid wolf multiplies during the incubation period and can also call forth an antibody response. So it is very difficult in such a study of exposed individuals to evaluate the antibody levels appearing late in the course of immunization. Also in this vaccine group was an individual who survived and yet at no time during the entire course of treatment had any antibody. In my opinion, this individual is one of those persons who do not respond to antigens and I think, undoubtedly, never had an effective exposure to rabies.

As a result of the earlier experimental data and these field trial results, the WHO committee has recommended the routine use of a single dose of antiserum followed by a course of at least 14 doses of vaccine for all severe exposures (7). Two further practical points on the use of antiserum should be mentioned. Experimental results as yet untested in the field indicate that local infiltration of part of the total dose of antiserum about the bite wound increases its effectiveness. Finally, the anti-

Table 3. Neutralizing antibody levels in serum samples of group B patients exposed to head and neck bites of rabid wolf and treated with one dose of serum and complete course of vaccine

| Patient No. | Out-come | Antibody titers on days after start of treatment ¹ | | | | | | | | | | | | |
|-------------|----------|---|----|----|-------|----|-------|----|-------|-------|-------|-------|-------|-------|
| | | 1 | 3 | 5 | 7 | 10 | 12 | 15 | 17 | 19 | 21 | 29 | 41 | 53 |
| B1----- | S | 6 | + | 22 | + | 6 | ----- | tr | ----- | ----- | 8 | tr | tr | 13 |
| B2----- | D | tr | + | 20 | + | tr | tr | tr | tr | tr | ----- | ----- | ----- | ----- |
| B3----- | S | 6 | + | 10 | + | 6 | ----- | 5 | ----- | ----- | 5 | 13 | 6 | ----- |
| B4----- | S | tr | + | 8 | + | 13 | ----- | 18 | ----- | ----- | 6 | 8 | + | 13 |
| B5----- | S | 0 | + | 15 | ----- | 13 | ----- | tr | ----- | ----- | 5 | tr | ----- | ----- |
| B6----- | S | tr | tr | 6 | tr | 8 | ----- | 8 | ----- | ----- | 30 | 67 | ----- | 112 |

¹ See footnote 1 and legend, table 2.

SOURCE: Reference 6.

Table 4. Neutralizing antibody levels in serum samples of group C patients exposed to head and neck bites of rabid wolf and treated with complete course of vaccine only

| Patient No. | Out-come | Antibody titers on days after start of treatment ¹ | | | | | | | | | | | | | |
|-------------|----------|---|---|---|---|----|----|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 1 | 3 | 5 | 7 | 10 | 15 | 19 | 21 | 25 | 29 | 33 | 41 | 45 | 53 |
| C1----- | D | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 50 | 85 | 66 | ----- | ----- | ----- | ----- |
| C2----- | S | 0 | 0 | 0 | 0 | 0 | 0 | tr | 5 | 13 | 6 | ----- | 19 | ----- | 5 |
| C3----- | D | 0 | 0 | 0 | 0 | 0 | 0 | ----- | 0 | 0 | ----- | ----- | ----- | ----- | ----- |
| C4----- | D | 0 | 0 | 0 | 0 | 0 | 0 | tr | ----- | 18 | 27 | 22 | 15 | 89 | 18 |
| C5----- | S | 0 | 0 | 0 | 0 | 0 | 0 | ----- | ----- | ----- | 0 | ----- | 0 | ----- | 0 |

¹ See footnote 1 and legend, table 2.

SOURCE: Reference 6.

serum presently available commercially in this country is a concentrated horse serum, and tests for sensitivity must be performed before its use. Serum sickness in from 5 to 20 percent of the treated cases is to be expected.

Vaccination Schedules

Research effort in recent years aimed at reducing the severity of prophylactic measures and reactions to them stems from two facts.

First, the currently used rabies vaccine is still a crude biological product. The vaccine is a heavy suspension of rabies infected rabbit brain in which the virus has been inactivated by various chemical or physical agents. Fourteen to twenty-one or more injections are made with this crude brain emulsion in as many days. All treated patients get local reactions, usually of moderate severity. Also, the necessity of a large number of daily visits to the physician requires actual physical residence at a center

where treatment is available. This is a hardship for those patients whose homes are far from a medical facility.

The second fact concerns severe and dangerous reactions to the vaccine, the most important of which involve the central nervous system. Experimental work by Morgan (8), Rivers and associates (9), and others strongly suggests that these reactions are directly related to the multiple injection of the brain tissue contained in rabies vaccine. The relative importance of this postvaccinal problem of encephalitis or paralysis varies in different parts of the world. In general, we in the United States are more concerned than rabiologists in other countries. Other than concern about the influence of poor reporting on the evaluation of the severity and frequency of reactions, the chief reason for American interest probably lies in the fact that, with our low mortality from rabies, it is estimated we have more cases of central nervous system reactions to vaccine than deaths from

the disease. Ten to twenty-five percent of these reactions are fatal.

Because of the severity of the procedure, the practical difficulties involved, and the fact that the occurrence of postvaccinal CNS reactions seem related to the number of injections of brain tissue, investigations are under way to determine the feasibility of reducing the number and size of vaccine injections. Fox and associates (10) have shown that 3 doses given 5 days apart give good serum antibody levels in man. This type of study in nonexposed human volunteers is currently being investigated further by the WHO committee. Tables 5 and 6 show the results of our experiments in mice in testing the relative efficacy of different schedules of immunization (11). Table 5 shows the effect of variations in number and spacing of vaccine doses when the total dose is the same for all groups, and table 6 evaluates the same effect when each individual dose is the same in all groups. In either case, it is obvious that daily doses did not give much better protection against intracerebral virus challenge or produce antibodies at a significantly higher level than some of the less severe schedules. In general,

Table 5. Effect of same total vaccine dose given in various schedules on immunity to intracerebral challenge and neutralizing antibody response in mice¹

| Group | Dose (ml.) | Days | LD ₅₀ protection (logs) | Serum dilution 50 percent neutralization |
|--------|------------|--|------------------------------------|--|
| A----- | 0.1 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. | 3.7 | 187 |
| B----- | .4 | 1, 5, 10----- | 3.4 | 56 |
| C----- | .6 | 1, 10----- | 2.9 | 80 |
| D----- | .2 | 1, 3, 5, 8, 10, 12. | 4.1 | 68 |
| E----- | .6 | 1, 8----- | 2.2 | 32 |
| F----- | .4 | 1, 2, 8----- | 2.2 | 46 |
| G----- | .3 | 1, 2, 3, 8----- | 2.2 | 56 |
| H----- | .3 | 1, 2, 3, 10----- | 3.3 | 187 |
| K----- | .4 | 1, 2, 10----- | 2.6 | 95 |
| L----- | .3 | 1, 2, 8, 12----- | 3.3 | 279 |
| M----- | .3 | 1, 2, 3, 12----- | 3.3 | 279 |
| O----- | .4 | 1, 2, 12----- | 2.6 | 162 |

¹ Ultraviolet irradiated vaccine was used diluted to 0.6 percent suspension. Intraperitoneally immunized mice were bled on the 14th day and challenged intracerebrally on the 15th day.

SOURCE: Reference 11.

Table 6. Effect of various vaccine doses and schedules on immunity to intracerebral challenge and neutralizing antibody response in mice¹

| Group | Days | LD ₅₀ protection (logs) | Serum dilution 50 percent neutralization |
|--------|--|------------------------------------|--|
| A----- | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. | 4.2 | 944 |
| B----- | 1, 5, 10----- | 3.3 | 1,084 |
| C----- | 1, 3, 5, 8, 10, 12----- | >4.7 | >3,125 |
| D----- | 1, 2, 3, 10----- | 3.2 | 625 |
| E----- | 1, 2, 8, 12----- | 2.1 | 64 |
| F----- | 1, 2, 3, 12----- | 3.5 | 71 |
| G----- | 1, 10----- | 1.1 | 90 |
| H----- | 1, 2, 12----- | 1.4 | 43 |
| K----- | 1, 2, 10----- | 2.3 | 215 |

¹ Phenolized vaccine was used diluted to 1 percent suspension. Intraperitoneally immunized mice were bled on the 14th day and challenged intracerebrally on the 15th day. All individuals were given 0.2 ml. of vaccine.

these results indicate the importance of 2 or 3 early primary doses followed by a booster dose at or after the 10th day.

Avian Embryo Vaccines

Other studies have attacked the problem of reactions to brain tissue vaccines from the standpoint of finding effective vaccines in which the factor responsible for these reactions has been removed or of making vaccines from material other than brain tissue. The former has been accomplished in the laboratory but has not proved practical in vaccine production (2). A fair amount of research has been carried out by Fox (10), by the WHO rabies committee (4), and by Dr. Hilary Koprowski on the possible use in man of live attenuated chick embryo rabies vaccine similar to that currently used in canine immunization. Thus far, this vaccine has been given to several hundred individuals with no deleterious effect. However, in contrast to results in dogs a single dose does not produce immunity in man as indicated by a serum antibody response. Several booster doses are required before antibody becomes demonstrable. In other words, in the dog this vaccine acts as a live virus vaccine with multiplication of the attenuated virus, but in man it acts as an inactivated virus vaccine, and the

virus probably does not multiply. Fox has shown good antibody response after 3 intradermal doses given 5 days apart, and Koprowski has evidence that a single intradermal dose given to individuals who have received rabies vaccine even several years previously will have a booster effect and result in a prompt antibody rise.

In a recently developed vaccine, now commercially available, the rabies virus is produced in duck embryos and is inactivated by beta propiolactone (12). This "killed" virus vaccine when used in multiple doses comparable to the brain tissue vaccines is effective in protecting experimental animals against virus challenge and in producing an antibody response in man.

In conclusion, there is hope in the future for the development of a rabies vaccine devoid of the potentiality of producing severe or fatal central nervous system reactions, but by far the most significant recent accomplishment in the field of rabies prophylaxis in man has been the further development of rabies antiserum and the demonstration in a clinical trial of its superior efficacy when combined with vaccine.

Summary

Previous experimental evidence of the greater efficacy of rabies antiserum as an adjunct to rabies vaccine over that of vaccine alone has been confirmed in a dramatic clinical trial. Two doses of antiserum given 4 days apart together with 21 daily doses of vaccine completely protected 5 individuals severely exposed by the bite of a rabid wolf in Iran. One of seven comparably exposed patients who received one dose of antiserum plus a course of vaccine died of rabies, while 3 of 5 receiving vaccine alone succumbed. Serum antibody studies of blood samples of these individuals showed the presence of antibody early and late in the course of treatment in those receiving both serum and vaccine but only in the late period when vaccine alone was used.

Experimental investigations in animals and in man suggest that the number of doses of vaccine may be reduced with proper spacing without markedly reducing its effectiveness. The importance of a booster dose given 10 days after the primary doses was apparent.

Attempts to eliminate severe neurological reactions to rabies vaccine have stimulated research with two types of vaccine produced from avian embryos. In laboratory tests, both appear comparable to the currently used brain tissue vaccine.

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Taking Care of Diabetes

ELEVEN FILMSTRIPS IN SOUND AND COLOR

Designed to help the diabetic patient and his family, each of the 11 filmstrips depicts some phase of the problem of diabetes control. These 35-mm. filmstrips, originally produced in 1950, were reissued in 1956.

What Is Diabetes? 47 frames, 8½ minutes. Helps a patient develop a wholesome attitude toward diabetes by giving him a better understanding of his condition and how it can be controlled; emphasizes the need of cooperation with the doctor, acceptance of the major responsibility for management and control of his diabetes, and maintenance of a positive point of view.

Eating for Good Health. 46 frames, 7 minutes. Stresses the role of food in controlling diabetes and maintaining good health; aids the diabetic and his family in gaining a better understanding of the patient's condition and the foods he may eat.

Insulin and Its Use. 69 frames, 13 minutes. Attempts to give the patient an understanding of what insulin is, where it comes from, how it functions in the body, and why some people with diabetes need to take it; shows the different kinds of bottle insulin; and illustrates a method of care and handling of the equipment necessary for the injection of insulin, and demonstrates the technique for injecting insulin.

Planning Good Meals. 52 frames, 9 minutes. Shows the patient how he can plan a wide variety of meals by using his meal plan and exchange list and explains the function of the various kinds of foods—carbohydrates, proteins, fats, vitamins, and minerals—in maintaining health.

Buying Good Food. 50 frames, 8 minutes. Explains how certain foods are arranged in groups called exchange lists, illustrates how the lists help patients in buying food in ordinary grocery stores, and shows the variety of foods to be selected and their relative value.

Insulin Reaction. 39 frames, 6 minutes. Helps the person with diabetes recognize and understand the symptoms of an insulin reaction; shows some of the causes, ways of preventing, and effective means of emergency treatment; and points out the serious effects reactions can have on a patient.

Tests in Diabetes. 38 frames, 6½ minutes. Shows the relation of urine sugar testing to the degree of control of diabetes, how the patient can test his urine for sugar, and outlines action the patient can take when tests are repeatedly positive.

Cooking Good Meals. 40 frames, 8 minutes. Gives the recommended practices that apply to cooking for the whole family, shows they apply also to the diabetic, and notes different ways of preparing food.

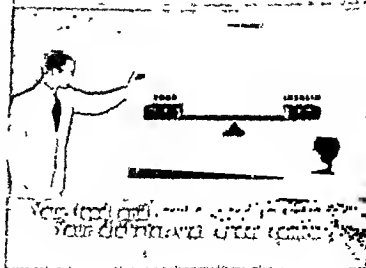
Diabetic Coma. 33 frames, 5 minutes. Gives some understanding as to what diabetic coma is and how it develops; discusses its seriousness, the need of seeing a doctor when the danger signs appear, and the importance of daily urine and sugar tests, following a meal plan, and taking just the right amount of insulin in order to avoid diabetic coma.

Care of the Feet. 49 frames, 8½ minutes. Demonstrates why the diabetic patient should take proper care of his feet, how to select proper fitting shoes and socks, and what exercises aid in maintaining good blood circulation and health of the feet; how other serious difficulties from poor circulation, injuries, and infections can be prevented.

Selecting Meals for All Occasions. 52 frames, 8 minutes. Emphasizes the use of certain basic foods, such as meat, fruit, and milk, for providing variety in food selection and assuring the selection of the right foods to eat in different situations—when one is ill, going on a picnic, eating at a friend's house or at a restaurant, or taking lunch to work.

Audience: The patient and his family.
Availability: Loan—Communicable Disease Center, Public Health Service, 50 7th Street, NE., Atlanta, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

Diabetic coma develops slowly...
It can be prevented



Radiation Preservation of Food

H. F. KRAYBILL, Ph.D.

SOON after World War II, studies sponsored by the Atomic Energy Commission disclosed that ionizing radiation could be used to preserve foods, and a new concept of food processing appeared. Preservation of food promises to be one of the most important peaceful uses of atomic energy.

Since food spoilage bacteria can be destroyed effectively by radiation with only a small rise in temperature, not more than 10° C., and with remarkable speed, it is conceivable that irradiated foods can be made to surpass in flavor and texture foods preserved by other methods. Current research, sponsored largely by the Department of the Army, is directed toward this goal, as well as the demonstration of safety and nutritional adequacy.

Although many problems regarding the quality of certain irradiated foods remain to be solved, radiation treatment presently offers several interesting possibilities for increasing the supply of perishable food and safeguarding health. At levels much lower than the 2 or 3 million rep (roentgens equivalent physical) necessary for sterilization, radiation inhibits sprouting of potatoes (10,000–30,000 rep), destroys trichina in pork (30,000 rep), increases the keeping quality of perishable foods under refrigeration (50,000–100,000 rep), and destroys insect infestation (50,000–100,000 rep).

Either gamma or electron sources are used for radiation preservation of food. Mixed fis-

sion products (spent fuel rods from nuclear reactors) and cobalt-60 are the sources of gamma rays. Resonant transformers, Van de Graaff generators, and linear accelerators are the electron sources. Penetration of radiation from a gamma source is greater than that from an electron source, but a gamma source has the disadvantage of requiring continuous shielding. An electron source can be turned off and on.

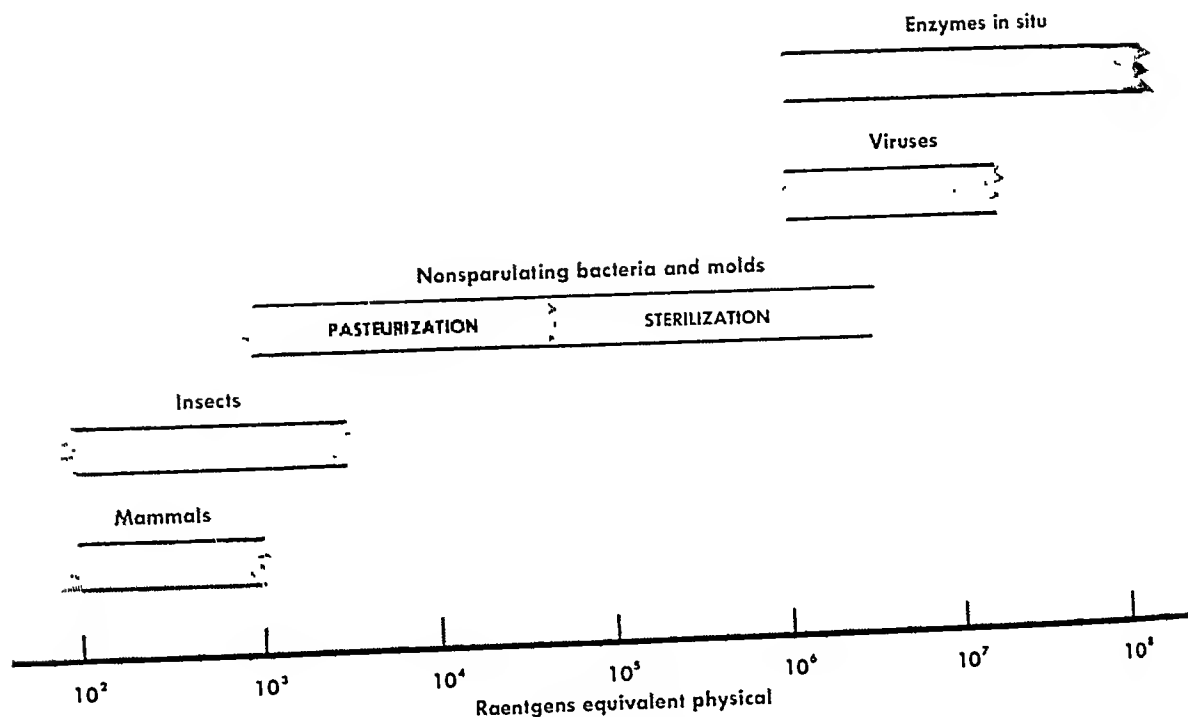
Since pasteurization or sterilization of food requires rather high levels of radiation, higher than the level required for lethal effects against mammals and insects but lower than that for viruses and enzymes (fig. 1), it might be anticipated that rupture of chemical bonds would occur during processing. This has been found to be true. The molecular alteration in fat, protein, and carbohydrate in food produces certain noticeable changes in odor, color, flavor, and texture (1). The effect of radiation on meat, which has been studied extensively, may be summarized as follows:

- Protein change: Increase in creatinine.
- Production of sulfur compounds: Hydrogen sulfide and mercaptans produced at 70,000 rep.
- Pigmental changes: Oxymyoglobin and metmyoglobin formed.
- Enzyme inactivation: Proteinases inactivated at 1.6×10^6 rep.

Much of the current research work is concentrated on improvement of texture and flavor in an effort to increase acceptability of irradiated food. Foods sensitive to radiation undergo changes in sulfur-containing compounds, proteins, and unsaturated fatty acids as a result of interactions with free radicals during irradiation. One method of counteracting these effects would be the introduction of com-

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Figure 1. Radiation dosages producing lethal effects in certain biological systems.



pounds that would serve as free radical acceptors. Such compounds, of course, must be acceptable as chemical additives. Other possibilities include packing the food under an inert gas atmosphere (nitrogen or helium, for example), prestoring the food to reduce the available oxygen, blanching prior to irradiation, and vacuum packing.

Since alteration in chemical structure is induced by radiation, it is possible that toxic degradation products may be produced through transformation of the macronutrients (fat, carbohydrate, and protein) and the micronutrients (vitamins) in the foodstuff. Assuming that radiation processing is technologically successful and economically feasible, it is likely that some day a significant proportion of man's diet will consist of irradiated food. It must be demonstrated, therefore, that foods treated with radiation are nontoxic to humans and that they are at least equal in nu-

tritive value to foods preserved by canning or dehydration.

An excellent procedure for evaluating the wholesomeness of radiation-sterilized food has been described by Lehman and Lang (2). They suggest that studies on wholesomeness be directed along two major lines: potential toxicity and nutritional adequacy. Absence of induced radioactivity, carcinogenicity, and antigenicity must be established through extensive toxicity testing. Chemical and physical examination of the food prior to animal studies may provide important information for design of the toxicological study. For disclosing toxic effects, it is standard practice to challenge an animal with a relative excess of the test substance. For determining nutritional adequacy, the challenge should be made by reducing the vitamin supplement added to the basal ration to a level at which nutrient inadequacy would be intensified.

Since the various species of animals, and even strains of the same species, frequently differ in sensitivity, a number of different species, such as the rat, the mouse, the dog, the monkey, and the chicken, should be included in the testing program. As radiation-induced changes in food are extremely subtle, the usual gross observations of growth, reproduction, and food consumption may not adequately describe toxic or harmful effects. It is desirable to include in the experiments a measure of cellular metabolism as a supplement to the gross observations. This can best be accomplished through application of enzyme analyses of tissues of the animals on the experimental diets.

Since March 1954 the Office of the Surgeon General, Department of the Army, has sponsored, through contracts with various institutions, a broad research program relating to wholesomeness of irradiated food, as outlined (see inset). Working closely with the Office of the Surgeon General in directing this program is the Food and Drug Administration, Department of Health, Education, and Welfare.

Induced Radioactivity

In first considering the possibilities of preserving food by means of radiation, it was assumed that the process would not induce radioactivity in the food, since gamma and electron sources are used and a neutron flux is not involved. One of the few direct studies of this question supports this assumption: No detectable amount of radioactivity was found in 24 common food elements that had been irradiated with a 1,000-curie cobalt-60 source (3).

Investigators are currently considering the possibility that accelerated electrons with beam energies greater than 10 Mev. might induce measurable amounts of radioactivity. Radiation preservation, however, is accomplished with beam energies far below this level. Also, Peterson and associates (4) noted that, following a nuclear explosion, food in unbroken containers at a distance of 1,700 feet from ground zero would be safe to eat. Induced radioactivity apparently is no problem in radiation processing of foods, provided no source of neutrons is present.

Toxicity Studies

One of the earliest studies of toxicity was reported by DaCosta and Levenson (5). These investigators found that a capacitronized synthetic ration fed to male and female weanling rats produced no deleterious effects on growth. However, there was impairment in the fertility of the male and increased mortality in litters that they believed was due to destruction of vitamin E. These findings were later corroborated by Poling and associates at the Swift and Company Research Laboratories in studies of irradiated ground beef (6). They found that male infertility and viability of the young were readily corrected by supplementation of the diet with vitamin E.

Similar studies on irradiated butterfat (7) and on irradiated dried whole eggs (unpublished report by B. E. Proctor and John T. R. Nickerson of the Massachusetts Institute of Technology) indicate that these products have a slight effect on growth rate but essentially no toxic effects.

A three-generation mouse-feeding study, in which a semisynthetic diet sterilized by steam

Army Wholesomeness Studies

Short-term feeding (8 weeks). Army Medical Nutrition Laboratory and the University of Colorado: rat and man; Wisconsin Alumni Research Foundation: rat.

Longevity, reproduction, and lactation. Agricultural and Mechanical College of Texas: rat and chicken; University of Michigan: rat and chicken; Oregon State College: rat; Cornell University: dog; Columbia University: rat; Johns Hopkins University: rat; University of Illinois: rat and dog.

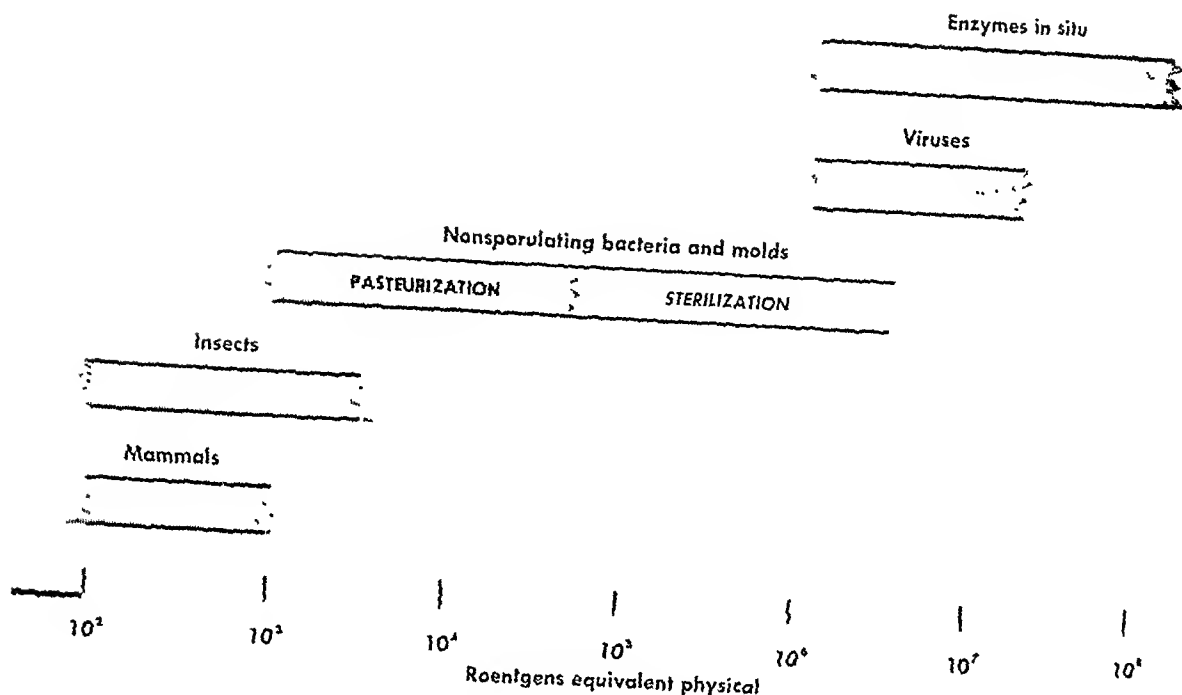
Nutritional adequacy. University of Illinois (protein): rat; University of California at Los Angeles (fat): rat; Alabama Polytechnic Institute (vitamins): rat.

Digestibility. University of Rochester: dog.

Carcinogenicity. Wisconsin Alumni Research Foundation: rat and mouse.

Antigenicity of irradiated proteins. Army Medical Nutrition Laboratory and the University of Colorado: guinea pig.

Figure 1. Radiation dosages producing lethal effects in certain biological systems.



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The effect of gamma radiation on carbohydrate has been studied extensively by Johnson and Metta (11). They found no significant alteration in the physiological energy of carbohydrate.

An important criterion in the evaluation of protein quality is the biological value of protein. Johnson and Metta have determined the biological value of the proteins of beef, milk, peas, and lima beans irradiated at 3 million rep, as shown in the table (11). According to this study, radiation has virtually no effect on the biological value of beef protein. The biological value of milk protein is reduced about 16 percent by radiation, as compared with about 6 percent by heat. Experiments in which irradiated milk was supplemented with various amino acids indicate that radiation causes a loss of cystine in milk protein. The decreased biological value of irradiated pea protein is probably due to destruction of sulfur amino acids, whereas the biological value of lima bean protein, which was improved considerably by heat but only slightly by radiation, can be accounted for by the destructive effect of heat on trypsin inhibitor.

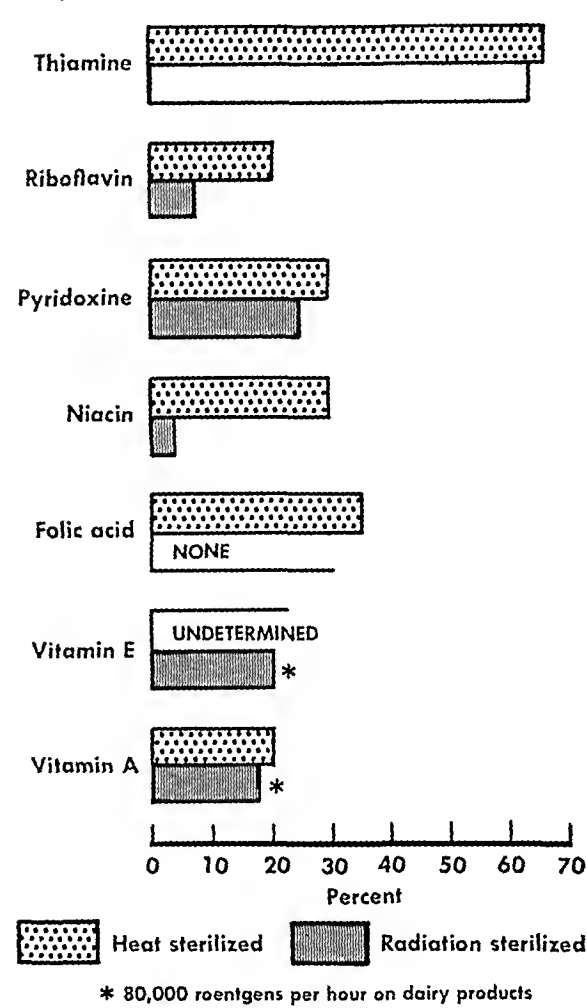
Effects of heat sterilization and radiation sterilization on biological value of meat, milk, lima beans, and pea proteins

| Food | Biological value (percent) ¹ | | |
|-----------------|---|-----------------|----------------------|
| | Raw | Heat sterilized | Radiation sterilized |
| Meat..... | 78 | 78 | 79 |
| Milk..... | 90 | 84 | 74 |
| Peas..... | 59 | 58 | 50 |
| Lima beans..... | 50 | 68 | 51 |

¹ Biological value = $\frac{\text{nitrogen utilized}}{\text{nitrogen absorbed}} \times 100$.
Source: Reference 11.

The fat soluble and water soluble vitamins are sensitive to ionizing radiations, some more so than others. Proctor and Goldblith (12) have made extensive studies on the effect of ionizing radiations on the B vitamins. While ascorbic acid is radiosensitive, riboflavin and niacin are radioresistant in dilute solution. Niacin in solution has a protective effect on

Figure 3. Percentage destruction of vitamins in various foods sterilized by heat and by ionizing radiation.



ascorbic acid. Foods act as natural protectors; for example, vitamin B₁₂ in milk is decreased only 30 percent, whereas in aqueous solution 68 percent is destroyed. Although the destruction of vitamins due to radiation preservation may appear significant, most investigators feel that the vitamin loss is no greater than that experienced during thermal processing (fig. 3).

Gross effects from feeding irradiated foods to experimental animals have been measured by such indexes as growth, reproduction, and lactational performance. More recently, however, measurements of the activity of representative tissue enzymes involved in the metabolism of potential irradiation end products by the ani-

or cathode rays was compared with an unprocessed ration, revealed no differences in growth, general appearance, or reproduction. However, the mice raised on the irradiated diet exhibited some impairment in lactational performance (8).

Short-term rat-feeding experiments with irradiated foods have been conducted by the Wisconsin Alumni Research Foundation, the Armour Research Foundation, and the Army Medical Nutrition Laboratory jointly with the University of Colorado to determine whether the foods are potentially toxic and to provide wholesomeness clearance for palatability testing by human subjects at the Quartermaster Food and Container Institute for the Armed Forces. Approximately 40 foods have received clearance by this procedure, and an additional 59 have been approved by extrapolation.

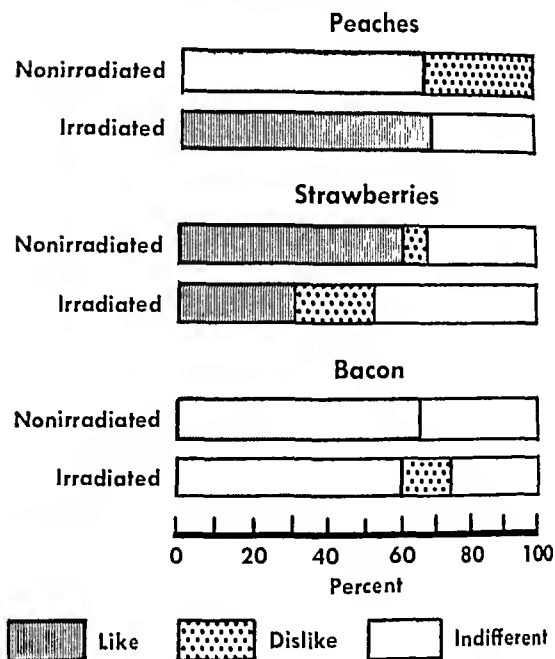
The irradiated foods that have received wholesomeness clearance have been fed for 30 days at levels of 35, 65, 80, and 100 percent of the total calories in the diet to 10 human volunteers at the Army Medical Nutrition Laboratory. No untoward effects have been observed, and the volunteers have indicated equal acceptance of nonirradiated and irradiated foods (treated at 3 million rep) with only a few exceptions (fig. 2).

To evaluate the effects of a diet composed entirely of irradiated food, experiments in which rats receive such a diet are being conducted at the Army Medical Nutrition Laboratory. The diet is so composited as to provide proper levels of fat, carbohydrate, and protein. No adverse effects have developed through the first two generations.

Other longevity experiments with organ meats, pork, and a laboratory basal ration indicate that these irradiated foods are satisfactory for growth when fed at high levels to successive generations of rats. With other test species, such as the dog and the chicken, it has been demonstrated that, in comparison with a nonirradiated ration, irradiated rations support good growth, normal reproduction, and average food consumption.

Because of the possibility that irradiation may produce carcinogens in food, extensive investigations have been conducted by Teply and

Figure 2. Acceptability of typical irradiated and nonirradiated food: percentage distribution of ratings by test subjects.



Kline (9) to determine whether irradiated sterols in extracts of egg, yeast, and pork will induce spontaneous tumor formation in rats and mice when injected, fed, or painted on the skin of the test animal. From their experiments to date, there is no clear evidence of the production of carcinogens by irradiation of the food materials under study.

Nutritional Adequacy

The nutritive quality of irradiated food is evaluated by measuring the biochemical effects of ionizing radiation on individual macronutrients and micronutrients, as well as by observation of effects on animals in feeding experiments. Irradiated foods are compared with unprocessed foods and with heat-sterilized foods.

Andrews and co-workers (10) have shown that fats having peroxide values of 100 or less are not harmful to rats, whereas higher levels of peroxides produced by irradiation or oxidation are toxic. However, foods sterilized at 3 million rep have peroxide numbers well below 100, usually in the range of 70 to 80.

Training Opportunities

FOR

PUBLIC HEALTH PERSONNEL

From a 10-State survey it has been estimated that some 17,000 professional positions in State and local health departments throughout the country call for graduate or specialized public health preparation, and that almost 9,000 persons in these positions have not had such training. Thus, more than half of our Nation's public health workers have not had the training that provides a sound and balanced knowledge of the multidisciplinary technical aspects of health problems and of the relationship of health problems to the socioeconomic fabric of the community.

DURING the past decade new research discoveries and developments in the health sciences have immeasurably enhanced the potential benefits of public health protection. Many health authorities have been quick to accept and to plan for the broader concepts in public health which have evolved from these developments. But they have been faced within the same period with an acute and worsening shortage of trained health personnel in all categories. In many States and communities, as well as in Federal agencies, plans and hopes remain unfulfilled because the kind and

number of personnel needed to translate ideas into action have simply not been available. The problem has been with us for a long time, but it has become more pointed with each forward step in public health techniques and practices.

The need for more and better qualified personnel has been further intensified by the growth in the population to be served by public health programs. Since 1951 there has been a 10 percent increase in our national population. During these same years, the number of full-time personnel in State and local health departments has increased only 6 percent.

Indeed, we actually have fewer physicians and engineers in public health today than we had in 1951, with 15 million more persons to be served. According to recognized standards, we have less than half the physicians and nurses needed to extend basic minimum health services to the entire country—and not quite two-thirds the number of sanitation personnel that would be required. Besides this basic personnel, the newer health programs require a

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mal provides more accurate information on the effect of feeding either irradiated or nonirradiated diets. At the Army Medical Nutrition Laboratory we have noted, for example, a higher activity of cytochrome oxidase in tissues from rats on irradiated diets than those maintained on nonirradiated diets. The difference was statistically significant at the 5 percent level. This would suggest that some interruption in lipid metabolism has been effected.

Summary

Treatment of foods with ionizing radiation promises revolutionary advances in food-preservation possibilities. There are still major technological problems in regard to acceptability of certain foods processed with a radiation dose of 2 or 3 million rep. However, treatment at lower radiation levels, which produces such results as inhibition of sprouting of potatoes, destruction of trichina in pork, increase in the keeping quality of food under refrigeration, and destruction of insect infestation, is generally successful.

In experimental work undertaken thus far, radiation-sterilized foods have not been found toxic, nor has any evidence of carcinogenicity appeared. In animal feeding experiments with a wide variety of irradiated foods, reproduction and lactational performance in general are the same as for animals maintained on nonirradiated diets. One worker, using an irradiated synthetic diet, demonstrated slight impairment in lactational performance of mice, but this effect has not been induced in other animal species by feeding them irradiated foods. The nutritive value of these foods has been found to be equivalent to that for heat-processed foods.

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In addition to physicians, nurses, and sanitary engineers well-grounded in public health, present-day programs require the services of dentists and dental hygienists, health educators and nutritionists, laboratory technicians and veterinarians, statisticians and medical social workers, and a growing array of other groups with professional training supplemented by orientation to the public health aspects of their special fields.

Despite the seriousness of the situation with regard to trained personnel, efforts to improve it dwindled over a number of years. From a high point in 1947, when more than 900 persons in State and local health departments were given more than 4 months' training during the year, the annual number steadily declined to a low of 373 in 1956. Further, during that year 35 States had no physicians in training; 34 States had no engineers or sanitarians in training; and 17 States had no nurses in training—although shortages were, and are, most severe in those categories.

In recent years short-term nonaccredited courses sponsored by State and local health departments have, in large measure, replaced accredited postgraduate training in public health. For example, a number of States have established field training programs, designed to meet immediate needs of personnel in specific professional and subprofessional groups. These courses offer much of value, particularly in sanitation, laboratory, and related areas. A considerable amount of necessary training and vocational experience can also be supplied through orientation classes, inservice training, refresher courses, institutes, and workshops dealing with general areas of public health and with particular health problems. However, this brief, informal instruction, though important, is in no way a substitute for postgraduate education. It does not replace the broad indoctrination in public health provided by academic courses of study.

Training Funds

The financing of training, particularly accredited professional training, must, of course, compete in health department budgeting with the financing of the whole range of health pro-

grams and services for which, it is safe to say, no health department has completely adequate resources. In planning the expenditure of available funds, however, setting aside a portion to provide formal public health training for staff members, present and future, is wise budgeting, even if it means resisting for the moment pressure for desirable current activities. Funds expended for training are an investment in the future.

There is evidence that many State health departments are fully aware of the wisdom of such an investment, that they are willing to assume their part of the joint Federal-State responsibility for improving the competence of personnel—when funds can be so used without sacrificing basic operations. However, since 1950, Public Health Service grants to States for preventive health services have shown a downward trend, from almost \$45,000,000 in 1950 to not quite \$22,500,000 in 1956. Because about 75 percent of their training activities had been supported over the years by Federal grant funds, State and local health departments were too hard pressed in many instances to consider more than minimal training courses for their employees.

Then for fiscal year 1957 the health grant total increased about 30 percent over 1956, to slightly more than \$29,000,000. Along with this brighter financial picture, fiscal year 1957 also shows, for the first time since 1951, a reversal of the downward trend in number of persons receiving advanced training under State and local sponsorship (see chart). The gain between 1956 and 1957 amounts to 8 percent (401 persons as against 373) and is reflected among 9 of the 15 occupational categories represented.

There are other hopeful signs, such as the increased enrollment in schools of public health—from 570 graduate or special students in the academic year 1949-50 to 874 during 1956-57 (excluding foreign students). Also more States and Territories are providing training opportunities. In 1957 there were 47 States sponsoring public health training as against 40 States in 1954; and in 1957, 75 percent of the trainees were sponsored by 16 States,

steadily increasing corps of workers representing a wide variety of professional categories. In addition, there are many demands for health personnel for foreign assignments, the armed forces, industry, research, and other official and nonofficial organizations.

Obviously, under these conditions our public health services cannot keep pace. Personnel shortages delay the initiation of needed studies and services concerned with chronic illness and aging, air and water pollution, radiological health, accident prevention, rehabilitation, and other issues brought into focus by our changing economy and population mobility. Further, the shortages hinder the improvement of current programs and prevent the strengthening of local health organization.

The lag is the more unfortunate because of the challenge presented by the forces of today. We see evidence of national vitality in the changing social and socioeconomic structure of the Nation; in the continuing population growth; in the longer life span achieved; in new and expanding industries and job opportunities; in the growth of urban and suburban areas, with ensuing metropolitan complexes. Much of this vitality can be ascribed to the success of the older, traditional public health function of controlling the common communicable diseases—the great killers of their day and dominant obstacles to the social and economic development of this and other countries. Now, in turn, the modern forces are reshaping public health philosophy and practice. The many advances in preventive and curative medicine have also contributed mightily to this reshaping. All these factors have added to the potentials as well as to the complexity of health protection, so that postgraduate training and residencies in public health practice have become as essential to this medical specialty as to the clinical specialties. In point of view, public health has advanced with the times, but its supply of trained workers has not.

Special Training Required

To say that there is a steadily growing need for more public health workers is not enough. Modern public health programs require well-trained personnel. An effective public health

worker must have, in addition to sound competence in his profession (medicine, nursing, engineering), an understanding of how to apply his basic discipline to community health problems. He must know how to take full advantage of available resources, how to make maximum use of recently developed scientific knowledge in the prevention and control of disease.

Each member of a health department staff must be keenly aware of the importance of good relationships among the several professions which make up the public health team. He must fit his own skills and knowledge smoothly into a complex organization.

Even the most dedicated and basically well-prepared employee learns these things more readily by special training than solely by instinct and on-the-job experience. Training alone does not make a superior health worker. Nevertheless, in general, the competence of the individual who already possesses other qualities essential to success in his field will be increased with advanced public health training.

One of the most critical areas of need is for trained public health physicians. The total number of physicians employed by State and local health departments has actually decreased since 1950. Last year, in health officer positions alone there were 436 vacancies. The application of specialist techniques in public health, requiring a wide variety of professional and ancillary personnel, makes all the more necessary the well-trained medical generalist who can see the public health program as a whole and maintain a balance in its direction. To fill these administrative positions adequately, physicians need formal public health training.

Such training is also highly important for other professional members of the modern public health team. A nurse's basic training is focused on bedside care of the sick. In public health, her primary purpose is preventing disease and disability. In order to do this effectively, she must learn to redirect her fundamental knowledge. The sanitary engineer, too, must learn the public health application of his skills in meeting community sanitation problems and in controlling environmental health hazards.

trained personnel in State and local health departments through a traineeship program which will bring into the field new people adequately prepared in all the needed disciplines. It is designed to supplement, and not to replace, the training activities currently sponsored by State and local governments. This aim promises a measure of relief to the health director long harassed by vacant positions and with consequent doubling-up of duties and responsibilities to the point where the release of even one staff member for full-time academic training makes worse an already bad situation. He is in the position of having to postpone the very measures that would improve staff efficiency and thereby relieve the burdens of understaffing.

In order to encourage new people to enter upon careers in the field of public health, this program seeks trainees among qualified individuals with less than 2 years' experience in public health work and less than 1 year of graduate or specialized public health training. Moreover, special attention is given to age (by a preference for candidates under 35), to the candidate's plan for using the training, and to his plans for future employment. Certain other aspects are also given consideration, such

as geographic distribution of candidates and the degree of shortages in the professional categories.

The traineeships are generally to be awarded for a period not to exceed 12 months. They are open to physicians, nurses, sanitary engineers, sanitarians, health educators, laboratory personnel, veterinarians, dentists, statisticians, nonmedical administrators, and other professional personnel whose skills are required in modern public health practice. In short, opportunities are offered to men and women who have completed their basic professional education to receive postgraduate training in public health. The traineeship awards are offered to them either directly by the Public Health Service or through grants to schools of public health and to colleges and universities offering public health nursing.

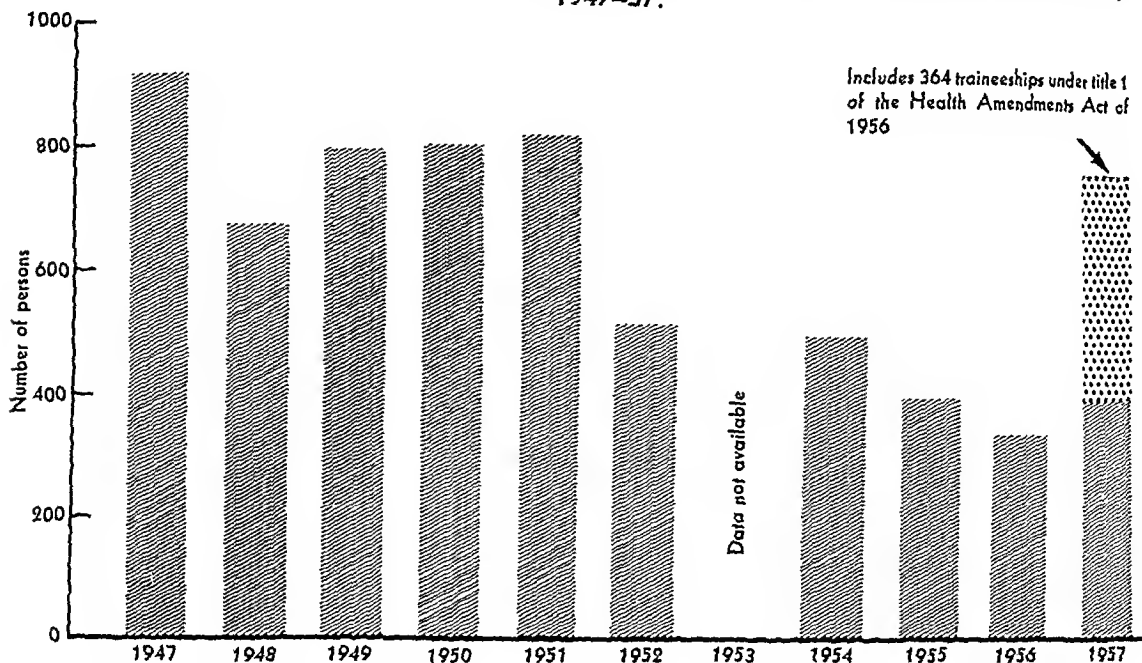
At the end of this program's first fiscal year of operation, 364 persons had been awarded traineeships for public health training to begin during the 1956-57 academic year, and the entire fiscal appropriation of \$1 million had been used.

Remarkable success has been achieved in a short time toward fulfilling the objectives of the traineeship program as to age and status of

Number of individuals awarded public health traineeships under title I of the Health Amendments Act of 1956 according to professional category, as of June 30, 1957

| Professional category | Number of trainees | Age | | | Years of previous public health training | | Years of previous public health experience | | | |
|---|--------------------|----------|-------|---------|--|-------------|--|-----|------------------|--------|
| | | Under 35 | 35-45 | Over 45 | Less than one | One or more | 0 | 0-2 | Over 2 through 5 | Over 5 |
| Physicians..... | 21 | 13 | 7 | 1 | 21 | 0 | 10 | 4 | 7 | 0 |
| Nurses..... | 199 | 161 | 36 | 2 | 199 | 0 | 101 | 66 | 21 | 11 |
| Sanitary engineers..... | 27 | 25 | 2 | 0 | 25 | 2 | 12 | 6 | 3 | 6 |
| Sanitarians..... | 25 | 20 | 5 | 0 | 24 | 1 | 3 | 5 | 12 | 5 |
| Laboratory personnel (bacteriology, immunology, chemistry, etc.)..... | 13 | 13 | 0 | 0 | 10 | 3 | 4 | 6 | 2 | 1 |
| Statisticians..... | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 |
| Health educators..... | 36 | 23 | 13 | 0 | 35 | 1 | 20 | 6 | 7 | 3 |
| Nutritionists..... | 6 | 6 | 0 | 0 | 6 | 0 | 5 | 1 | 0 | 0 |
| Medical social workers..... | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Dentists..... | 10 | 4 | 6 | 0 | 10 | 0 | 4 | 4 | 1 | 1 |
| Dental hygienists..... | 8 | 6 | 2 | 0 | 8 | 0 | 4 | 1 | 3 | 0 |
| Veterinarians..... | 9 | 5 | 4 | 0 | 9 | 0 | 4 | 1 | 3 | 1 |
| Nonmedical administrators..... | 7 | 5 | 2 | 0 | 7 | 0 | 5 | 1 | 1 | 0 |
| Total..... | 364 | 283 | 78 | 3 | 357 | 7 | 172 | 101 | 62 | 29 |

Number of persons receiving full-time accredited sponsored training of 4 months or more, fiscal years 1947-57.



as against only 8 States as chief sponsors in 1954.

These indications of progress are indeed welcome. But at this stage of cumulative needs and shortages, it is clear that some assistance over and above increased health grant funds is necessary if we are to avoid a serious lag in meeting total public health needs for a growing population and economy. New people must be drawn into the field not only to augment current staffs and programs, but also to provide a reserve from which replacements can be drawn. For example, an estimate, based on the 10-State sample survey, indicates that some 450 trained professional employees were lost to health departments in 1956 for such reasons as resignation, death, and transfer to jobs outside of official health agencies. In 1955 the loss was 546 workers. Thus, the group of 401 State-sponsored trainees in 1957 will not provide sufficient replacements for even normal attrition in health departments.

New Forces Toward Solution

Leaders in the field saw the situation as increasingly wasteful of valuable knowledge, gained in large part through the basic research activities long and strongly supported by the

Federal Government. Potentially effective public health planning, based on the newer developments in the health sciences, lay dormant instead of being applied to the never-ending fight against disease, disability, and death. Within Congress there was serious concern and desire for immediate action, plus recognition of the fact that understaffed health departments and agencies needed assistance in meeting the problem.

The Health Amendments Act of 1956 became law (P. L. 911, 84th Cong.) on August 2, 1956. Under title I of this act, Congress authorized the Public Health Service to establish a program to provide graduate or specialized public health training for health personnel in a variety of professional fields, and appropriated \$1 million for the first year's operation.

The bill was also specifically concerned with stimulating advanced training for professional nurses (title II) and with expanding and improving vocational training programs for practical nurses (title III). Each of these two programs received \$2 million for fiscal year 1957.

We are concerned here with title I of the Health Amendments Act. The basic purpose of this section is to alleviate the serious lack of

The Rural Health Unit in the Philippines

MALCOLM J. FORD, M.D., M.P.H., and AMADEO H. CRUZ, M.D., C.P.H.

IN the countries of the East, more and more interest is being focused on rural areas because of the rise in population, the importance of food production, and the progress of land tenure reform movements. Providing local health services to rural inhabitants is of major significance and, in the Philippines, the government's health program has recently been recharted to bring these services to every municipality in the Republic.

Historical Review

Public health in the Philippines appears to have been fostered by the Franciscan friars. In 1577, Friar Clemente of the Order of Friars Unilova set up a medical dispensary for the indigent of Manila in the Posteria of the Franciscan convent in the Intramuros, or old walled city of Manila. This eventually became the San Juan de Dios Hospital, which operated at its original site for 368 years, up to the Second World War. Following the creation of this institution, other hospitals were built in many other parts of the Philippines.

In 1690, during the Spanish occupation, the Dominican Padre Juan de Pergero was instrumental in installing a water system for the town of San Juan del Monte and for Manila. Charles IV of Spain sent his personal physician, Dr. Francisco Javier de Balmis, to Mexico, Central and South America, and the Philippines, where he arrived in 1805 to introduce

smallpox vaccination. The following year, the Central Board of Vaccination was established. It was the earliest official public health organization in the Philippines. In 1876, the Spanish Government appointed *medicos titulares*, who were essentially the provincial health officers of that day, and, by the end of the Spanish regime, there was an official of this type in every province but one. Most *medicos titulares* were Spanish.

A further step in the development of public health was the creation of the Superior Board of Health and Charity in 1888, and one of the last achievements in health under the Spanish occupation was the addition of a 2-year course in some fundamental medical and dental subjects to the curriculum of the University of Santo Tomas in 1898. Graduates of this course, *cirujanos ministrantes*, served as male nurses and sanitary inspectors. In remote areas, they ministered to the sick in the absence of a physician or dentist.

With the American occupation came a change in health administration. Act 157 of the Philippine Commission in 1901 set up a Board of Health of the Philippine Islands; and in the same year, Acts 307 through 309 provided for provincial and municipal boards of health, with both Filipino and American members.

In 1906, the provincial boards of health were replaced by district health officers with jurisdiction over health districts. The districts were usually coextensive with a province but sometimes encompassed more than one province or parts of provinces. Further evolution in public health took place in 1912 with the "Fajardo Act," which created sanitary divisions, essentially geographic divisions of municipalities within the provinces. They included 1 to 4 municipalities; each was assigned a "president," who had to be a duly qualified

At the time of this study, Dr. Ford was rural health adviser to the United States Operations Mission to the Philippines. He is now chief, Special Health Services, Region 7, Public Health Service. Dr. Cruz serves as project director of the rural health units project, Department of Health of the Philippines.

trainees, and distribution among professional categories and among suitable academic institutions (see table). Of the 364 individuals given traineeships through June 1957, more than three-fourths were under the age of 35. Most of the remainder were between 35 and 45 years. Only three persons were over the age of 45.

Somewhat fewer than half of the total receiving traineeships, 172 persons, had had no previous experience in the field of public health. Of the remaining 192 trainees, 101 had had 2 years' or less experience in public health; 62 had been in such work for from more than 2 years through 5 years; and only 29 had been in the field for more than 5 years.

Awards were made to representatives in 13 different professional categories. The academic institutions where the trainees studied included 11 schools of public health; 32 colleges and universities offering public health nursing (with recognized programs allowing a major in public health nursing); and 19 other institutions, including 14 engineering schools.

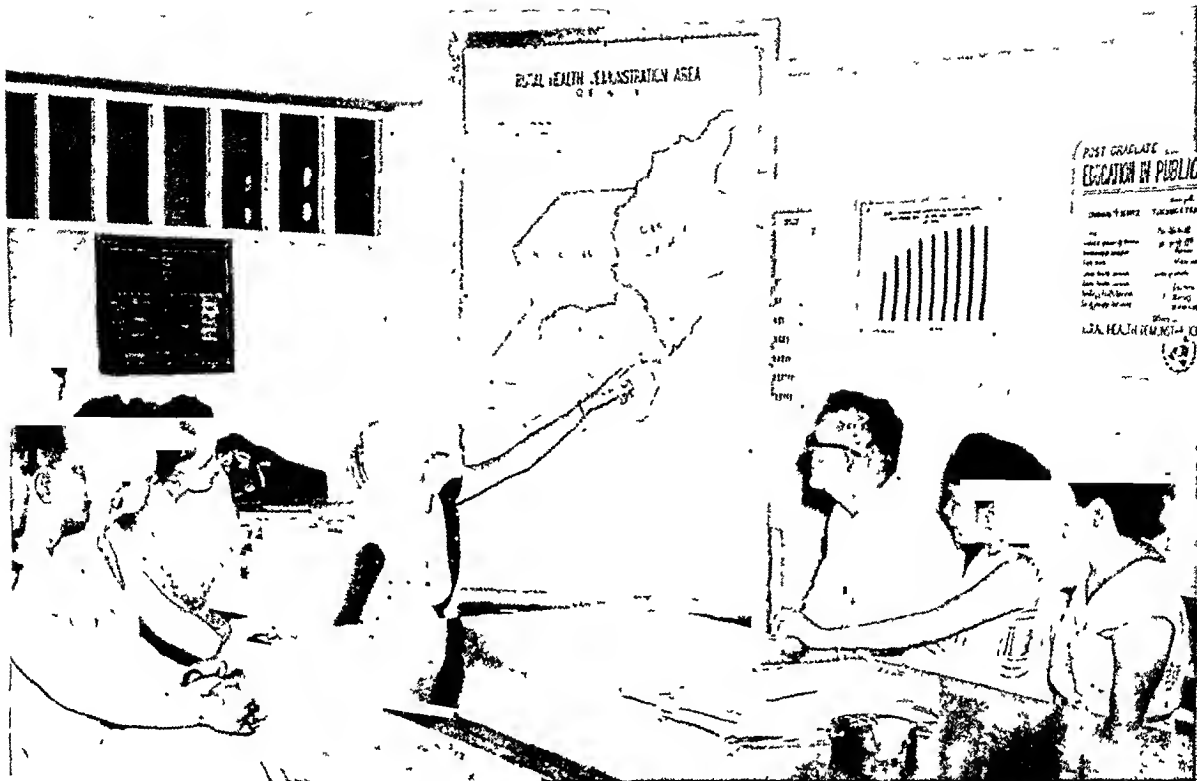
In December 1956 a national advisory committee appointed by the Surgeon General to assist the Service in planning the 1957-58 operation of the traineeship program met in Washington and reviewed the standards and methods used for the previous year. The committee discussed the merits of broadening the traineeship range in the future to include teachers and research personnel, and of supporting 1 individual for 2 years of training. It also made plans for a national evaluation confer-

ence in 1958, which Congress directed as part of the legislation.

In summary, the new program of Public Health Service traineeships in its first year of operation added 364 trainees to the 401 receiving full-time accredited State-sponsored training—a combined total of 765 trained public health workers for potential employment in health departments and agencies. This total group provides a definite upswing to the prolonged decline in such activities. This is a good beginning, even though we realize that training must be provided for an even larger number of current and potential health department employees in the coming years, if we are to enlarge health and personnel resources adequately.

In accordance with the President's request, Congress doubled the appropriation for the traineeship program for fiscal year 1958, providing \$2 million for the coming year. With this support, we can expect to see soon some concrete results in terms of increased availability of trained personnel for State and local health departments. It is expected that in the second year of operation, public health traineeship grants will be made to 11 schools of public health and approximately 44 universities and colleges nationally recognized as preparing registered nurses for beginning positions in public health nursing.

On the basis of the 1956-57 accomplishments, this program can be viewed as a definite impetus to the solution of the large and continuing problem of keeping personnel skills at a high level by constant training.



ICA photograph

The largest number of rural health unit personnel were trained at the Quezon City Rural Health and Demonstration Center, a part of the rural health program in the Philippines. Here, the center's project director illustrates its scope and functions.

tion of the province. Often, where other organizations were inactive, his own local activities offered the sole medical services to the community. He apparently had no official control over the puericulture centers and essentially none over the various specialized programs.

In 1954, the bureau of health had 402 physicians, 152 nurses, 15 midwives, and 1,478 sanitary inspectors in the rural areas. With the 450 charity clinics operated by the bureau of hospitals and 500 active puericulture centers, there were an additional 880 physicians, 1,185 nurses, and 295 midwives employed at least part time in the rural areas.

Professional Health Workers

The duties of the sanitary inspector cover a wider field of activity than they do in the United States. In the Philippines, the sanitary inspector is an all-round health worker. He gives first aid and immunizations, makes sani-

tary surveys, diagnoses and treats disease, and fills out birth, death, and morbidity certificates. There is one stationed in more than 90 percent of the country's municipalities. In many areas, he is the first and only official health worker and sometimes the only government worker of any type. Educational requirements are high school graduation, and, before 1954, training was by the apprentice method. He still favors the khaki uniform with appropriate insignia and assumes the "parade rest" posture when in the presence of health officers, suggesting the quasi-military background of his specialty.

Midwifery is fairly well advanced in the Philippines, though there are many opportunities for improvement. In order to receive a license from the Board of Medical Examiners, the applicant must have completed an 18 months' course in a school approved by the government and have actually performed a specified number of deliveries under supervision.

physician, for supervision of health work. Usually a sanitary inspector and occasionally a nurse were also assigned to the sanitary division.

Dr. Jose Fabella, the first Secretary of Health and Welfare of the Philippines, brought about the establishment of puericulture centers in 1925 for maternal and child health care in local areas. They were supported by voluntary contributions matched by national funds received from the National Sweepstakes Fund. These puericulture centers were staffed for the most part by a nurse or midwife and a woman attendant, assisted by a part-time physician. The program was largely confined to prenatal services concentrating on the delivery event. These centers still suffer from insufficient local support and lack of year-round personnel.

Under Dr. Fabella, municipal maternity and charity clinics were also set up in 1939. They operated in municipalities and municipal districts of less than 8,000 in population and were directed by either a physician, nurse, or midwife. Salaries included a basic compensation and an additional amount for deliveries personally attended, up to a specified maximum. Compensation of personnel assigned to certain hardship areas was doubled if they were non-residents of these areas at the time of appointment. In some instances, treatment of the indigent sick in these clinics duplicated the work of the sanitary divisions.

In 1947, the Philippine Department of Health reorganized into bureaus: the bureau of hospitals; the bureau of quarantine; and the bureau of health, for supervising preventive health services throughout the country. This reorganization placed administration of city health departments at the bureau level and placed many specialty programs, such as tuberculosis control, health education, and nutrition in the division of laboratories. The municipal maternity and charity clinics were now under the bureau of hospitals, and the sanitary divisions, under the bureau of health.

At the mid-century mark, many separate local health programs had accumulated. The president of the sanitary division was charged with duties in preventive medicine in addition

to medical care. Frequently, he had no more than 1 or 2 sanitary inspectors to assist him. He was required by the act creating his office to "provide himself with the necessary appliances and also the instruments for all emergency cases, medical, surgical, and obstetrical." He had an advisory relation only to the puericulture centers. There were about 400 sanitary divisions serving about 1,200 municipalities.

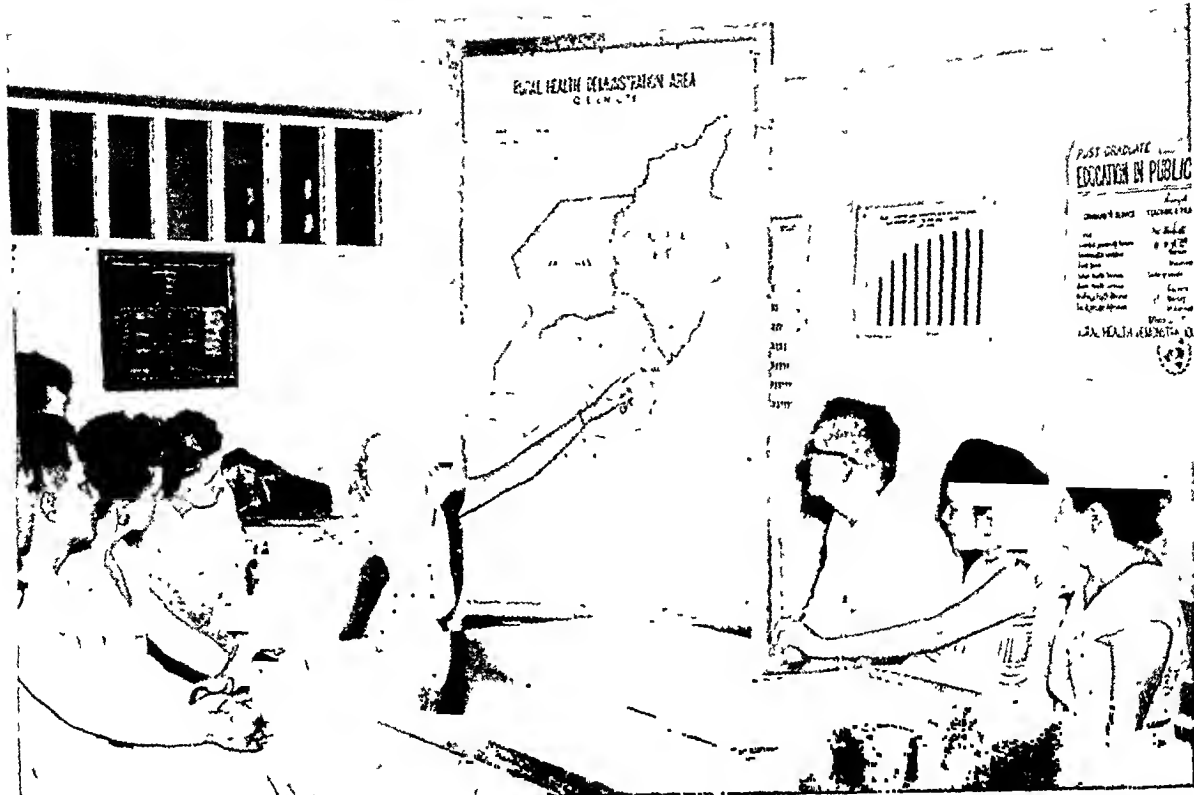
The activities of all local health units were confined almost entirely to the *poblacion* or town center, leaving the outlying *barrios* or rural areas relatively unserved.

The specialty programs concentrated on isolated phases of the health problem, such as malaria, tuberculosis, venereal disease, and health education. A program of immunization, principally for smallpox, was carried out by vaccinating parties, which were made up of nonprofessional workers who covered specified areas. Their schedule called for a visit to each province once in 5 years. Nominally supervising this group of activities in the province was the district health officer, whose actual authority apparently extended only to the presidents of the sanitary divisions. He also had general supervision of the health of the people of the province. The number of sanitary inspectors, nurses, and clerks he had to assist him depended on the size and popula-



ICL photograph

Nurse at the El Salvador Rural Health Unit, Misamis Occidental, gives prescribed medication to sick baby.



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Schools of nursing also leave something to be desired but are generally very acceptable. A bachelor's degree in public health nursing is offered by the University of the Philippines, and nurses were recently admitted to the Institute of Hygiene, the government university's postgraduate school of public health.

Physicians and engineers receive good specialty training in public health in the institute, which grants the certificate of public health and, provided a specified grade is maintained and a thesis approved, the degree of master of public health. Approximately 50 students are graduated each year, about 40 of whom are physicians. The faculty is well trained, and visiting teachers are provided by Johns Hopkins University under sponsorship of the Rockefeller Foundation and by the U. S. International Cooperation Administration.

Rural Population

According to an official estimate, the population of the Philippines in 1956 was 22,265,330. Of the three general areas in the Republic, Luzon Island is the most densely populated. Next in population density is the central or Visayan group of many smaller islands, and last is Mindanao Island. Palawan and Mindanao Islands, with the most acreage of essentially uninhabited land, are the main areas involved in the resettlement area program of the government.

The Filipino is predominately a rural citizen. At least 70 percent of the people live in rural areas and engage in predominately agricultural occupations. The 53 provinces are subdivided into municipalities, the basic government units, and the seat of municipal government is in the *poblacion*, situated where the population is densest. Elected officials of the municipality are a mayor, council members, a treasurer, police, and justice of the peace. Frequently the *poblacion* is also the site of an ancient church constructed during the Spanish regime. Scattered throughout the remainder of the municipality are more or less clearly defined subdivisions known as *barrios*. These are governed by a *teniente* or community leader, who is elected in some cases but who usually serves without pay, and a *barrio* council. An even

smaller division is the *sitio*, hardly more than a collection of houses. The following illustrates the population levels of the municipalities according to the census of 1948:

| Population groups | Number of municipalities |
|-------------------|--------------------------|
| Under 5,000 | 203 |
| 5,000-20,000 | 631 |
| 20,000-40,000 | 229 |
| 40,000 and over | 50 |

Another geographic division is the municipal district, which is administered entirely by appointed officials and has less autonomy than a municipality.

A peculiarity of the country is the large expanse of some of its 27 cities. Some of these have large areas that are definitely rural. One is said to be larger in area than any other city in the world, and another has parts which, until recently, were unexplored. The cities have their own government separate from the provincial administration.

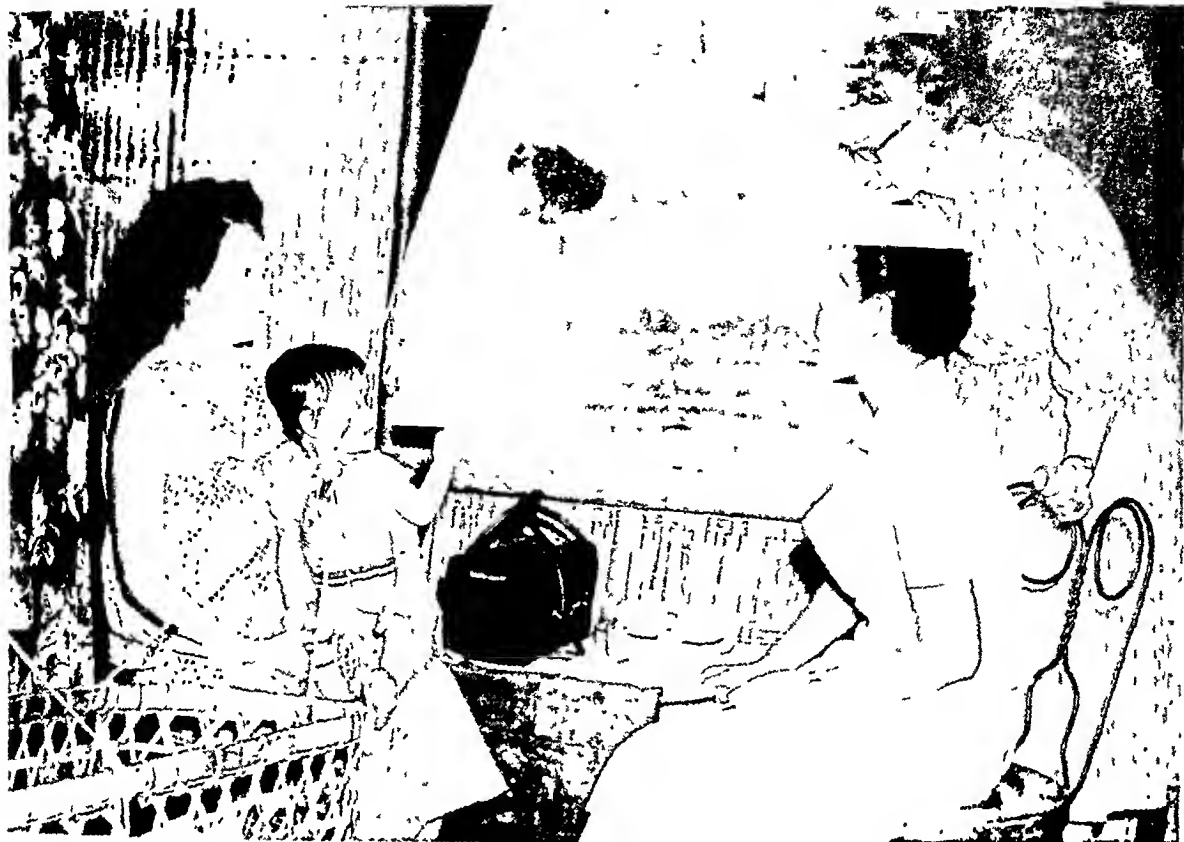
Medical and Auxiliary Personnel

The distribution of medical and auxiliary personnel is predominantly urban. In July 1955, physicians in Manila and other urban areas numbered 4,996 out of an estimated population of 6 million, while the estimated rural population of 15 million had only 3,331. The number of medical school graduates examined annually by the Board of Medical Examiners more than quadrupled (249 to 1,050) between 1949 and 1954.

In 1954 there were 3,030 graduate nurses active in the country, a ratio of 1:5,400 of population. The ratio ranged from 1:940 in Manila to 1:26,972 in one of the provinces. Seventeen provinces had less than 1 nurse for each 10,000 persons. During the 5-year period 1950-54 a total of 2,533 nurses were licensed by the National Board of Nurse Examiners. There were 2,167 inactive nurses in April 1954. In the same month, there were 1,173 registered midwives, 287 of whom were in Manila.

Morbidity

As with most nations of Malayan ancestry, pulmonary tuberculosis is an important problem in the Philippines. The tropical climate



ICA photograph

ICA nursing consultant and her counterpart, a Filipino rural health nurse, make a home visit to a rural home in Tala, Rizal.

contributed much to the role of malaria as a leading cause of morbidity and mortality, but fortunately this disease is rapidly disappearing as the result of a successful residual spray program. Because of poor sanitation, the enteritides and schistosomiasis continue to be prevalent. The Philippines is the second most important endemic area in the world for *Schistosoma japonicum*; and, particularly among children, yaws, dermatophytoses, scabies, and "tropical ulcer" are common. Also, the effect of poor food habits and relatively low standards of living have contributed to the reported high incidence of nutritional deficiencies.

Campaigns against highly epidemic diseases, such as cholera and smallpox, have been successful. Small outbreaks have occurred, but no significant incidence has been reported for many years. The last recorded case of smallpox was in 1949, and of cholera, in 1935.

Appropos of this is the quality of mortality

and morbidity reporting which leaves much to be desired. Reports from rural areas have been, in a high percentage of cases, from nonmedical personnel or from physicians who have never seen the cases.

High infant mortality, presumably related to poor obstetrical care, poor sanitation and nutrition, is another public health problem. In 1953 more than one-fourth (29.9 percent) of the deaths in the Philippines occurred below age 1, and more than one-half (53.5 percent) below age 3. Most deliveries are performed by the traditional birth attendant, or *hilot*, an unlicensed, untrained midwife. Informal reports of the percentage of deliveries by *hilots* range around 85 percent. Estimates of the proportion of deliveries by licensed midwives and nurses are about 10 percent, and by physicians, 5 percent. Hospitals usually take care of only abnormal deliveries, most women preferring to be delivered at home.

Following the establishment of the first mission of the U. S. Mutual Security Agency to the Philippines in 1951, the Department of Health made numerous studies of the health situation in cooperation with the Health Division of the mission. In 1952 the rural health unit project was formed. This project concentrated on a demonstration of integrated health services at the municipal level and provided a team of professional health workers for the demonstration. In most instances, communities without puericulture centers or charity clinics were chosen as sites for the demonstration. Teams of Filipino professional health workers, each consisting of a physician, public health nurse, midwife, and a sanitary inspector, were employed by the Department of Health with funds from the Philippine Council for United States Aid, and assigned to 81 municipalities. The U. S. Mutual Security Agency contributed equipment and supplies to the project. Each unit received a jeep, refrigerator, instrument sterilizer, microscope, examining tables, various medical instruments, and a supply of medicine calculated to last a year. These units were put into the field in 1953. In the subsequent year, additional units were set up in 52 sanitary district offices.

By the end of fiscal year 1954-55, a total of 244 units had been built up to a basic staff of 4 and given necessary equipment. Concurrently with the inception of this project, a training program was set up for the orientation of incoming personnel. Training centers were founded in four major cities of the Philippines. Also, the Rural Health Demonstration and Training Center in Quezon City was utilized. The orientation course, lasting about 6 weeks, consisted of a general review of public health programs, the organization of the department of health, and various administrative procedures in the conduct of local health services.

The *barrio* medical kit was an early feature of this rural health program. Its purpose is to furnish prompt medical care to the isolated *barrio* during the interim when more comprehensive phases of the rural health program

are being organized. Essentially, the kit is a large plywood case containing a supply of relatively simple drugs and remedies which could be used with a minimum of medical supervision. Accompanying it is a manual covering basic sanitation, nutrition, health education, first aid, and emergency treatment of common conditions found in rural areas. The kit is preferably placed in a new hut or a house specially constructed of local materials, but sometimes the residence of a prominent citizen is satisfactory.

The kit is administered by a *barrio* health committee of from 3 to 5 members, usually including a teacher and a sanitary inspector, if one is stationed in the area. Supervision is assigned to the municipal health officer. Usually, the provincial health officer is also particularly interested in the project and assists in its organization and supervision.

Local health services have been assisted by the United Nations Children's Fund, mainly in the form of support of special programs, including maternal and child hygiene, yaws control, and BCG vaccination.

The Rural Health Act of 1954

In July 1954, the Congress of the Philippines passed the Rural Health Act, calling for the establishment of a rural health unit in every municipality and municipal district of the Philippines. It also made several administrative changes in the rural health program, among them the appointment of municipal health officers, the changing of the name of the district health officer to provincial health officer, the establishment of dental services in each congressional district, and the general increase in salaries of local health personnel. It also appropriated for this program 4 million pesos (\$2 million, at the official rate) plus 1 million pesos annually for 4 years. The target date for full application of the act is July 1958.

The act called for two categories of units, a senior unit of a physician, public health nurse, midwife, and sanitary inspector; and a junior unit with a combination of a physician or a nurse plus a midwife or a sanitary inspector. Every municipality or combination of municipal districts with a population of more than

Status of rural health units relative to staffing projected under the Rural Health Act

| Fiscal year | Total units in operation at end of fiscal year (complete and incomplete) | Junior units | | Senior units | | | |
|-------------|--|----------------------------|---------------------|----------------------------|---------------------|---------------------------------------|------------------|
| | | Cumulative total completed | New units completed | Cumulative total completed | New units completed | Raised to complete units ¹ | Incomplete units |
| 1955..... | 1, 000 | ----- | ----- | 650 | ----- | ----- | 350 |
| 1956..... | 1, 100 | 66 | 66 | 801 | 34 | 117 | 233 |
| 1957..... | 1, 200 | 132 | 66 | 952 | 34 | 117 | 116 |
| 1958..... | 1, 300 | 198 | 66 | 1, 102 | 34 | 116 | ----- |

¹ To be raised to complete staff of four members before end of fiscal year.

5,000 was to receive a senior unit. Those of more than 35,000 were given a junior unit in addition.

An additional provision established a public health dentist in each congressional district, those with more than 150,000 population receiving an additional dentist. This was estimated to provide 162 dentists for the 102 congressional districts. Dental positions already in the public health programs were included in this total figure. This program has been developing slowly, and funds for travel and for equipment have been increased to accelerate its progress.

The Rural Health Act also set up the following new scale of salaries for local health personnel:

| <i>Position</i> | <i>Range</i> |
|------------------------------------|----------------|
| Municipal health officer..... | P3, 000-4, 200 |
| Public health dentist..... | 2, 400-3, 120 |
| Public health nurse..... | 2, 400-2, 580 |
| Midwife..... | 1, 440-1, 800 |
| Provincial sanitary inspector..... | 1, 440-1, 560 |

These salaries may be compared with the wages of private corporation employees compiled in a survey made for the Wage and Position Classification Office of the Philippine Government in 1954. These salaries apply to urban areas only:

| <i>Position</i> | <i>Interquartile range</i> |
|-------------------------|----------------------------|
| Physician..... | P2, 092-5, 550 |
| Dentist..... | 1, 515-4, 000 |
| Nurse (hospital)..... | 1, 266-1, 785 |
| Hospital attendant..... | 1, 075-1, 238 |

To fulfill the project in an orderly manner, a plan of operation was drawn up in 1954 in which the rural health units gradually pro-

gress towards the complete staffing called for in the act (see table).

As of July 1, 1956, the project was proceeding well, even a little ahead of schedule. The following is an analysis of the staffing of rural health units on that day in 1,317 municipalities and municipal districts, in reference to the projected plan:

| | |
|--|--------|
| Number with all four categories filled..... | 510 |
| Percent with all four categories filled..... | 38.8 |
| Number with three or more categories filled.... | 876 |
| Percent with three or more categories filled.... | 66.6 |
| Number with health personnel of any category.. | 1, 231 |
| Percent with health personnel of any category.. | 93.5 |
| Number of physicians on duty..... | 1, 013 |
| Number of nurses on duty..... | 814 |
| Number of midwives on duty..... | 855 |
| Number of sanitary inspectors on duty..... | 1, 491 |

Usefulness of Equipment

At the end of 1953, the 81 demonstration units were polled on their use of the various items of equipment. Among the items listed as most useful were the jeep, the outboard motor, the sphygmomanometer, stethoscope, microscope, examining table and chairs, and refrigerator. The following are the results of the poll, in general, and some observations made by unit personnel and consultants.

The most useful piece of equipment, according to 66 of the 81 units, was the jeep. Where any reasonable semblance of road existed, it increased the effective range of health unit personnel in their assigned areas. In most rural sections, automotive transportation, public or private, was still scarce. The jeep was used not only to transport unit personnel to the peo-

ple but also to carry patients to the hospital. It mobilized the unit. There were, however, few facilities for repair and maintenance in most rural areas. Also, since automobiles were relatively scarce in most of these areas, even among government officials, the jeep was subject to unauthorized use. In addition, relatively few Filipinos had been trained to drive or properly maintain automotive equipment. Solutions were being found to most of the problems, however, through revision of antiquated rules and regulations, training of personnel, and the maximum use of district engineer stations or vocational training schools.

Particularly useful in the Philippines for serving the more than 600 inhabited islands were outboard motors. Usually, the small islands are settled only along their coasts and since few or no roads exist inland, transportation must be by water, either on rivers or the open sea. Frequently, one municipality includes several small islands to which no public transportation is available. Motors were used to propel the traditional *banca* type of boat which could be maneuvered close to shore and which, when equipped with outriggering and a 25 hp. motor, could successfully negotiate stretches of open water. The same problems of supply and maintenance applied here but were not so large.

The original 81 demonstration units reported the sphygmomanometer and stethoscope to be the second most useful items. They were used extensively by physician, nurse, and midwife in maternal and child hygiene work. Most of these mercury type sphygmomanometers that were supplied apparently were in good condition after 3 years.

The original justification for the typewriter was for typing of records, reports, and correspondence. Correspondence was minimal, however, and many records were handwritten. There was considerable doubt that the usefulness of this item for persons not particularly trained in its use justified its relatively high cost.

The use of the microscope was mainly confined to the examination of urine (a small hand centrifuge was also supplied) and of feces for parasite ova. Blood smears for malaria were

examined occasionally and blood counts infrequently. The general opinion was that the microscope should be issued only to physicians who could be expected to use it efficiently. Fungus growth on the lens and some rust or corrosion were noted but less than expected in the tropical climate. Few facilities existed in the Philippines for repair and maintenance of microscopes.

For emergency and minor surgery, the original units were supplied with 12 mosquito forceps, 24 hemostats, 4 tissue forceps, 4 dressing forceps, 2 sponge forceps, 2 needle holders, 6 surgical scissors, and 2 grooved directors. Also included were an ether mask, an ether dropper, and rubber gloves. It was found that after 2 years of operation very few units had used more than 1 or 2 of the instruments. In many units most of the forceps were never removed from the original package. The ether mask and dropper were not known to have been used in any unit, and the rubber gloves in many instances had deteriorated. Rural health units were doing little more than repair of superficial lacerations or other very minor surgery; the equipment originally given exceeded actual needs, except for obstetrical forceps which were used by many units. Rural physicians evidently preferred to transport seriously injured or ill patients to the hospital than to operate under unfavorable conditions, especially if they did not have special training or experience in surgical procedures. Also, the hospital system in the Philippines was fairly well developed, there being at least one government hospital in every province.

The use of the refrigerator in rural health units has been mainly for storage of biologics, antibiotics, and perishable drugs. Few blood and urine specimens, water samples, or other materials for examination were stored in refrigerators, probably because the proposed system of regional laboratories had not been sufficiently developed to handle such work from the average health unit. Refrigerators up to 7 cubic feet were placed in units, but they were much too large for the average 4- to 5-worker unit in the present stage of development. The small 1½ cubic foot refrigerators are being ordered. Problems of operation also plagued

the use of this item. Many small towns had no electric current or had it only for varying periods of 6 to 12 hours a day. However, if the full capacity of the freezing unit were used to freeze ice during the time the unit was in operation, the box would be cool during the nonoperating period. Another apparently successful alternative was the kerosene refrigerator. Kerosene was usually available in the rural areas, and, when properly operated, this type of refrigerator seemed to function well in tropical climate.

The simply constructed metal examining tables and chairs were undoubtedly in use, as was other furniture supplied by the Philippine Department of Health. After much evidence that these items could be constructed locally from native materials, it was decided to foster this approach to stimulate interest in the health unit and its work. Such tables and chairs were frequently donated by individuals, with credit plainly lettered on the piece. Sample plans and bills of materials were supplied to local health officers. The items will therefore probably not be supplied to the Philippine rural health program by international assistance agencies in the future.

Electric and alcohol sterilizers were sup-

plied, as well as pans for use on primus stoves. The same difficulty was found with the electric sterilizer as with other electric appliances. Sterilizing instruments was possible at night when current was available but the unit personnel were not anxious to do the job then; they preferred to find other methods that could be used during the day. The large alcohol sterilizer needed a large amount of fuel to bring the necessary amount of water to a boil. Usually, it was used only to sterilize the larger instruments such as obstetrical forceps. The small alcohol syringe and needle sterilizer was useful in smaller clinics.

Conclusion

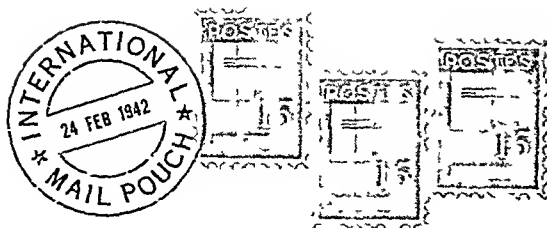
The background and salient points in the evolution and progress of local health services in the Republic of the Philippines have been presented with the expectation that the problems in that country are parallel with those in other countries in the area. Opportunities will arise in the future for exchange of information on the application of the Philippine program. One thing is certain: The rural people in the Philippines want these services, and the demand is large and steadily augmenting.

Tenth World Health Assembly

Surgeon General Burney headed the United States delegation at the Tenth World Health Assembly in Geneva, May 7-24, 1957. Highlights of the assembly were adoption of the 1958 budget of \$13,500,000 recommended by the executive board and unanimous acceptance of the invitation to hold the eleventh assembly in the United States. The U.S.S.R., Albania, Bulgaria, and Poland resumed active membership.

In addition to calling for more voluntary contributions to the special malaria eradication fund, the assembly approved a continuing WHO program in peaceful uses of atomic energy. This program includes training health physicists and physicians in public health aspects of atomic energy, scheduling an expert committee meeting on graduate public health training in atomic energy, and study of disposal of radioactive wastes.

Dr. Al-Wahbi of Iraq, president of the assembly, awarded the Darling Foundation Medal and Prize to Dr. Paul F. Russell of the Rockefeller Foundation for outstanding achievements in the control of malaria. The Leon Bernard Foundation Prize was awarded to Professor Kacprzak of Poland for his work in social medicine.



These paragraphs, based on overseas reports from public health personnel with missions and field parties of the International Cooperation Administration, give a glimpse into health work abroad. Most of the original material appears in an administrative publication distributed by the Public Health Division of the ICA.

Plaque for Sulimaniyah

The new health center of Sulimaniyah in Iraq received a silver plaque in honor of its part in the agriculture and industry exhibition held for the first time in that place. Visitors from town and village were received at the center with complete explanations of the uses of this facility. Sulimaniyah has been isolated from external influences. The economy is rural, the faith Islamic (Sunni sect), the language Kurdish (many dialects). Most Kurds also speak some Turkish, Farsi, or Arabic. Those who have been to school read, write, and speak Arabic and Kurdish and frequently have some understanding of English.

—M. ELIZABETH DARDEN, *public health nurse adviser, formerly with United States Operations Mission, Iraq.*

Smallpox Detection the Hard Way

On the afternoon of December 13 we received a report of smallpox in the village of Pishvah 45 miles southeast of Teheran in the Varamin area of Iran. Dr. Cyrus Arasteh and I readied an investigation team and vehicle and departed that night, in a mixture of snow and drizzle. We came to a flooded river where we charged with our 4-wheel drive around a bus and a large truck that were stuck side by side blocking the "road." But we mired in over the hubs and slammed against a high bank. Our hardy Iranian driver, Akbar, took off his shoes,

rolled up his pants legs to the hip, jumped out in the falling snow and icy water, and began digging furiously, singing gaily the whole time. An hour and a half later with the help of a cable to another car we wound ourselves up out of the sea of mud. In the meantime my efforts to help had amounted to my stepping off into space of the black night for a



A tiny Iranian gets immunized against smallpox in Iran's national campaign against the disease by one of the vaccinators trained by the International Cooperation Administration for the program.

6-foot fall into a ravine where I ended up with muddy water over my head. I had some damage to my knee and was litter bound for the rest of the night. During our investigation three cases of smallpox were found in a family that had recently arrived from Tabriz. Nine thousand persons in the area were vaccinated, and it was reported that no more smallpox occurred.

—FRANZ ROSA, M.D., *public health physician, United States Operations Mission, Iran.*

Endowment

In a village near Shiraz, Iran, the year-long efforts of a sanitary aide with the Public Health Cooperative Organization to build a sanitary program reaped an unexpected benefit. One of the villagers, who owned a small amount of property, became so impressed with what he had learned about sanitation and hygiene that he endowed the rent from one of his shops to the village council for sanitation in the village.

—ALBERT P. KNIGHT, M.D., *chief, Health Division, United States Operations Mission, Iran*

Characteristics of Large Medical Expenses

SELMA MUSHKIN, Ph.D.

Urban families spending \$1,000 or more for medical care in 1950 devoted a far larger share of their medical dollar to hospital and nursing services than did the average urban family. In more than 4 out of 5 of these families at least one member was hospitalized during the year. For these members the average length of hospital stay was about 27 days, as compared with an average stay in all short-term hospitals in 1950 of 8.1 days.

The \$1,000 or more out-of-pocket medical expense was usually attributable to the medical care spending of a single family member. Again in more than 4 out of 5 families there was a single member with a medical care outlay of \$500 or more. The remaining families fall about equally into two groups, large families with expenditures of \$200 or more for several individuals in the family and small families with two or more members with expenses totaling \$500 or more.

CURRENT interest in major medical insurance has focused attention on families who in any single year incur heavy medical expenses. A number of questions have been raised about the composition and characteristics of such expenses. To provide some answers to these questions, the Public Health Service has studied a stratified subsample of schedules of family income and expenditures obtained by the Bureau of Labor Statistics in its 1950 survey of spending habits of urban consumers.

In all, only 1.3 percent of urban families reported out-of-pocket medical care expenditures of \$1,000 or more, including premiums paid for voluntary health insurance but excluding the value of any benefits received. This percentage is the equivalent of about 400,000 urban families, with 1.4 million family members.

Medical care expenses of these families, however, totaled about \$655 million, or about 10.6 percent of the estimated \$6.2 billion total out-of-pocket expenses of urban families. Of this \$655 million, about two-thirds was spent by families with medical care costs of \$1,000 to \$2,000 and one-third, by those spending \$2,000 or more.

Study Methods

The methodology of the Bureau of Labor Statistics survey and that of the Public Health Service special study of a stratified subsample of the schedules obtained in this survey were summarized in an earlier report (1). The subsample used in the special study included some 2,414 consumer units (and 7,639 persons) out of the total 12,489 consumer units interviewed by the Bureau of Labor Statistics. It included, however, all schedules on which out-of-pocket medical care costs of \$1,000 or more were reported by the family. In all, there were 163 consumer units, composed of 553 persons, in the \$1,000-or-more category. Information from these schedules was weighted to adjust for the regional variation in sampling ratios. The tabulated figures adjusted in accordance with weights developed by the Bureau of Labor Statistics form the basis of the estimates presented here.

Use of a sample of this size necessarily involves considerable random error due to sampling. In this survey, there are additional important sources of error in that a single family respondent may have reported family expendi-

Miss Mushkin is an economist with the Division of Public Health Methods, Public Health Service.

tures for all family members and reports were made for the entire preceding year.

Types of Services

What types of health services are purchased by families spending \$1,000 or more?

The medical care bills of families spending \$1,000 or more have a very different health service content from that of the average urban family's medical bill. A far larger than average portion of their out-of-pocket medical expenses goes for hospital services and for special duty nursing. A smaller than average portion represents payments for dental services and for drugs.

While the average urban family spends about 12 cents of its medical out-of-pocket dollar for hospitalization (excluding services paid or reimbursed by voluntary insurance plans and those publicly financed), families with bills of \$1,000 or more spend more than 30 cents of their medical dollar for hospital services. Special duty nursing, which accounts for only 2 cents of each \$1 spent for medical care for all urban families, represents 14 cents of each \$1 of out-of-pocket medical expense for families with medical bills of \$1,000 or more. The average expenditure for special nursing services for these families exceeds the total amount spent for all medical care by the average urban family (table 1).

Within these averages there is a wide variation in distribution of out-of-pocket medical costs among classes of health services. This variation depends upon such factors as the nature of the illness, the level of family income, the size of the family and other family circumstances, entitlement to care under public or other programs, and eligibility for benefits under health insurance plans. About 8 out of each 10 families spending \$1,000 or more report at least one episode of hospitalization during the year. In some instances the expense of the hospitalized illness, including both hospital bill and physician services, accounts for a large share of the total family medical care expenditure. Length of hospital stay averages approximately 27 days for these hospitalized family members, as compared with an average length of stay in short-term general and special

hospitals for the whole United States population in 1950 of 8.1 days (2). (In assessing these lengths of stay, account must be taken of the fact that some long-term hospital care is included in the Bureau of Labor Statistics schedule information.)

Table 1. Distribution of annual out-of-pocket medical expenses, by type of health service, for all urban families and families with medical expenditures of \$1,000 or more, 1950

| Type of service | All families ¹ | | Families spending \$1,000 or more | |
|-------------------------|---------------------------|----------|-----------------------------------|----------|
| | Average | Per cent | Average | Per cent |
| Total..... | \$197 | 100.0 | \$1,573 | 100.0 |
| Insurance premiums..... | 34 | 17.3 | 55 | 3.5 |
| Physicians..... | 63 | 32.0 | 489 | 31.1 |
| Hospitals..... | 23 | 11.7 | 491 | 31.2 |
| Dentists..... | 30 | 15.2 | 110 | 7.0 |
| Nurses..... | 4 | 2.1 | 218 | 13.9 |
| Drugs..... | 28 | 14.3 | 122 | 7.7 |
| All other..... | 15 | 7.4 | 88 | 5.6 |

¹ Data for all urban families based on Bureau of Labor Statistics tabulations of entire sample, rather than Public Health Service subsample.

However, there are some families with \$1,000 or more of out-of-pocket expenses in which no member of the family was hospitalized during 1950. As may be expected, physicians' services in the home or office account for the largest part of nonhospitalized illness expense. For approximately 5 percent of the families special nursing costs account for more than 60 percent of out-of-pocket medical care expenditures. Dental services in some instances account for one-third or more of out-of-pocket expenses and range up to \$1,000 for individual families. These less frequent but nevertheless significant deviations from average medical expense burdens point to the need for broadening prepayment arrangements to encompass the broad range of services purchased by urban families (3, 4).

Expenditures of Individual Family Members

Are large family medical expenses the result of a single expensive illness or are they the ac-

cumulation of sizable expenses for several family members!

The largest portion of urban families with out-of-pocket expenses of \$1,000 or more—almost 87 percent—reported outlays of \$500 or more for a single family member. For about 7 percent of the families there were 2 or more family members each with \$500 or more in medical care expenditures. The remaining families spending \$1,000 or more were relatively large families that had no member with medical expenses of as much as \$500 during the year.

While family expenditures of \$1,000 or more during a year appear to be primarily attributable to the expense of a single member of the family, it is important to note that about 47 percent of all members of these families spend at least \$200, which is more than 3 times the amount spent by the average urban resident. Similarly, about half of these families had 2 or more members with medical care expenditures of at least \$200.

The distribution of expenditures of members of families spending \$1,000 or more for medical care differs markedly from the distribution of amounts spent for medical care by the urban population as a whole (table 2). While 65 percent of the urban population report expenses of less than \$50 a year, only 25 percent of the persons in families spending \$1,000 or more

Table 2. Percentage distribution of all urban residents and persons in urban families with medical expenditures of \$1,000 or more, by total out-of-pocket medical care expenditures, 1950

| Out-of-pocket medical care expenditures | Percent of all urban residents | Percent of persons in families spending \$1,000 or more |
|---|--------------------------------|---|
| Total..... | 100. 0 | 100. 0 |
| None..... | 17. 4 | 6. 0 |
| \$1-\$49.99..... | 47. 9 | 19. 3 |
| \$50-\$99.99..... | 17. 5 | 16. 2 |
| \$100-\$199.99..... | 10. 2 | 11. 8 |
| \$200-\$299.99..... | 3. 7 | 8. 0 |
| \$300-\$499.99..... | 2. 1 | 8. 9 |
| \$500-\$999.99..... | 1. 0 | 12. 8 |
| \$1,000 and over..... | . 2 | 17. 0 |

Table 3. Percentage distribution of all urban families and of urban families with medical expenditures of \$1,000 or more, by income class, 1950

| Income class | Percent of all urban families ¹ | Percent of urban families spending \$1,000 or more |
|------------------------|--|--|
| All income groups..... | 100. 0 | 100. 0 |
| Under \$2,000..... | 18. 6 | 6. 6 |
| \$2,000-\$3,999..... | 42. 7 | 30. 2 |
| \$4,000-\$5,999..... | 26. 3 | 24. 3 |
| \$6,000 and over..... | 12. 4 | 38. 9 |

¹ Data for all urban families based on Bureau of Labor Statistics tabulation of entire sample, rather than Public Health Service subsample.

report expenditures in this range. Almost 30 percent of the persons in these families spend \$500 or more.

Two important factors associated with these variations in patterns of spending, apart from differences in illness experience and in utilization of medical services, are family income and age of family members.

The average city family spends about 5 percent of its \$4,000 income after taxes for medical care (1). Urban families spending \$1,000 or more for medical care have an average income of nearly \$7,000, but more than 20 percent of their income goes for medical care. However, the individual schedules for these families show a great variation in income (table 3) and in the percent of income spent for medical care. Medical expenses vary from about 3 percent of current income to many times current income.

Families with large medical care bills have a lower proportion of children and a higher proportion of older people than the average urban consumer unit. About one-third of the urban population in the Bureau of Labor Statistics sample are under 19 years of age, whereas only about one-quarter of the persons in families spending \$1,000 or more are in this age group. Also, there is a smaller percentage of persons aged 19-44 years in families spending at least \$1,000 than in the urban population as a whole. The percentage of people aged

tures for all family members and reports were made for the entire preceding year.

Types of Services

What types of health services are purchased by families spending \$1,000 or more?

The medical care bills of families spending \$1,000 or more have a very different health service content from that of the average urban family's medical bill. A far larger than average portion of their out-of-pocket medical expenses goes for hospital services and for special duty nursing. A smaller than average portion represents payments for dental services and for drugs.

While the average urban family spends about 12 cents of its medical out-of-pocket dollar for hospitalization (excluding services paid or reimbursed by voluntary insurance plans and those publicly financed), families with bills of \$1,000 or more spend more than 30 cents of their medical dollar for hospital services. Special duty nursing, which accounts for only 2 cents of each \$1 spent for medical care for all urban families, represents 14 cents of each \$1 of out-of-pocket medical expense for families with medical bills of \$1,000 or more. The average expenditure for special nursing services for these families exceeds the total amount spent for all medical care by the average urban family (table 1).

Within these averages there is a wide variation in distribution of out-of-pocket medical costs among classes of health services. This variation depends upon such factors as the nature of the illness, the level of family income, the size of the family and other family circumstances, entitlement to care under public or other programs, and eligibility for benefits under health insurance plans. About 8 out of each 10 families spending \$1,000 or more report at least one episode of hospitalization during the year. In some instances the expense of the hospitalized illness, including both hospital bill and physician services, accounts for a large share of the total family medical care expenditure. Length of hospital stay averages approximately 27 days for these hospitalized family members, as compared with an average length of stay in short-term general and special

hospitals for the whole United States population in 1950 of 8.1 days (2). (In assessing these lengths of stay, account must be taken of the fact that some long-term hospital care is included in the Bureau of Labor Statistics schedule information.)

Table 1. Distribution of annual out-of-pocket medical expenses, by type of health service, for all urban families and families with medical expenditures of \$1,000 or more, 1950

| Type of service | All families ¹ | | Families spending \$1,000 or more | |
|-------------------------|---------------------------|---------|-----------------------------------|---------|
| | Average | Percent | Average | Percent |
| Total..... | \$197 | 100.0 | \$1,573 | 100.0 |
| Insurance premiums..... | 34 | 17.3 | 55 | 3.5 |
| Physicians..... | 63 | 32.0 | 489 | 31.1 |
| Hospitals..... | 23 | 11.7 | 491 | 31.2 |
| Dentists..... | 30 | 15.2 | 110 | 7.0 |
| Nurses..... | 4 | 2.1 | 218 | 13.9 |
| Drugs..... | 28 | 14.3 | 122 | 7.7 |
| All other..... | 15 | 7.4 | 88 | 5.6 |

¹ Data for all urban families based on Bureau of Labor Statistics tabulations of entire sample, rather than Public Health Service subsample.

However, there are some families with \$1,000 or more of out-of-pocket expenses in which no member of the family was hospitalized during 1950. As may be expected, physicians' services in the home or office account for the largest part of nonhospitalized illness expense. For approximately 5 percent of the families special nursing costs account for more than 66½ percent of out-of-pocket medical care expenditures. Dental services in some instances account for one-third or more of out-of-pocket expenses and range up to \$1,000 for individual families. These less frequent but nevertheless significant deviations from average medical expense burdens point to the need for broadening prepayment arrangements to encompass the broad range of services purchased by urban families (3, 4).

Expenditures of Individual Family Members

Are large family medical expenses the result of a single expensive illness or are they the ac-

Distribution of Aggregate Medical Expenses

The distribution of out-of-pocket medical care expenses of urban families in 1950 by class of service is compared with similar information from other sources in the accompanying tabular summary.

The Bureau of Labor Statistics survey findings are comparable to the distribution derived for out-of-pocket medical expense by the Health Information Foundation in its 1952-53 study. Differences between these data and other series are attributable primarily to the dissimilarity in definition of medical expense.

The Department of Commerce figures and the derived Social Security Administration estimates of personal medical care expenditures on which distributions usually published are based show gross private expenditures, including expenditures financed by families, by insurance plans, and, in some instances, by employers. The Bureau of Labor Statistics data presented here represent only family out-of-pocket expenses and exclude health insurance benefits received from the various plans and payments made directly or indirectly (through insurance plans) by employers. There are many other conceptual differences in the figures. Several preliminary analyses have been made which detail the

differences between a household survey estimate of medical expenses and the national aggregate estimates as prepared currently by the Department of Commerce (7b, 12-14).

Comparison of percentage distributions of medical care expenditures by type of service¹

| Type of service | Bureau of Labor Statistics | Health Information Foundation | Department of Commerce | Social Security Administration |
|-----------------|------------------------------------|-------------------------------|--------------------------|--------------------------------|
| | Out-of-pocket expense ² | | Gross costs ³ | |
| Total----- | 100 | 100 | 100 | 100 |
| Physicians----- | 39 | 38 | 37 | 32 |
| Hospitals----- | 14 | 12 | 20 | 26 |
| Dentists----- | 18 | 18 | 16 | 11 |
| Drugs----- | 17 | 17 | 15 | 18 |
| Other----- | 12 | 15 | 13 | 12 |

¹ Data relate to 1950, except the Health Information Foundation survey findings, which are for 1952-53.

² Excluding health insurance premiums paid.

³ Excluding administrative and other net costs of health insurance coverage; including benefits paid by health insurance plans.

SOURCE: References 7c, 15, 16, and 17.

were concerned principally with out-of-pocket expense for the whole gamut of consumer goods and services and not with collecting the supplementary data included on the schedule.

Prepayment for medical care expense may be expected to change the shape of the distribution curve of medical expense. The percentage of families with large medical expense, for example, should be lower today than prior to the growth of voluntary health insurance. Voluntary health insurance premiums, on the one hand, and benefits provided, on the other, should have evened out the distribution of medical spending and reduced the incidence of the large medical bill. Many other changes—demographic, scientific, economic, and institutional—have influenced the distribution of families by size of medical expense. Differences in design and scope of survey and in definition and size of family units, as well as

sampling errors, particularly at the tail of the distribution for expenses of \$1,000 or more, however, make it difficult to compare 1928-31 findings of the Committee on the Costs of Medical Care and later family surveys (8, 9).

A crude analysis of the trends since 1928-31 points to the need for additional study of the change in importance of the large medical expense. Two questions in particular are suggested. Has the cost of major illness increased more than average family expense for medical care? Has the relative number of expensive illnesses decreased? There are a number of trends which affect medical care outlays in diverse ways. For example, costs of care for some types of illness are lower today than 25 years ago because of changes in the incidence and severity of these illnesses and changes in methods of treatment which involve shorter hospital stays, use of antibiotics, and other new

Table 4. Percentage distribution of all urban residents and of persons in urban families spending \$1,000 or more for medical care, by age group, 1950

| Age group (years) | Percent of all urban residents | Percent of persons in urban families spending \$1,000 or more |
|-------------------|--------------------------------|---|
| All ages..... | 100. 0 | 100. 0 |
| Under 6..... | 12. 7 | 8. 7 |
| 6-18..... | 19. 1 | 15. 7 |
| 19-44..... | 38. 3 | 28. 0 |
| 45-64..... | 21. 3 | 33. 4 |
| 65 and over..... | 8. 6 | 14. 2 |

45 or over, however, is approximately half again as great in families spending \$1,000 as in the total urban population (table 4).

Voluntary Health Insurance Coverage

Are members of families with large medical bills covered under health insurance plans?

While families with large medical expense have higher than average incomes and include a larger than average proportion of older persons, they have about the same voluntary health insurance coverage as other families, measuring coverage only in terms of whether or not there is some participation in health insurance plans. The proportion of persons covered in each age group is approximately the same for all urban residents as for persons in families spending more than \$1,000 (table 5). For all ages combined, about 6 out of 10 persons are covered. In the older age groups, for all urban families as well as for families spending at least \$1,000 for medical care, the proportion covered is significantly lower than for younger age groups. Approximately 2 out of 3 persons aged 65 years or over in all urban families and about 2 out of 5 persons in this age group in families spending \$1,000 or more have some health insurance coverage. This finding of a decreasing proportion of coverage among the older age groups for urban residents parallels the data published in other studies, including the recent nationwide study of the Health Information Foundation (5,6,7a). The Health Information

Foundation found that in 1952-53, 57 percent of persons of all ages had hospital insurance; the proportion of persons covered declined to 54 percent in the age group 55-64 years and to 31 percent in the age group 65 years and over. The Health Information Foundation study includes rural as well as urban groups and relates to a later year.

The health insurance benefits for which members of families spending \$1,000 or more were eligible were patently not sufficiently broad in scope to cover the variety of medical services needed by these families. Health insurance coverage of those members who experienced a hospitalized illness was about the same as the coverage of all other members of the families spending \$1,000 or more and similar to the coverage of the urban population as a whole. About 56 percent of the members with hospitalized illnesses were covered under a health insurance plan. While data on amounts of health insurance benefits reported on the Bureau of Labor Statistics schedules are inadequate because of the volume of nonreporting, benefits shown on schedules (for which reports were made) averaged about 30 percent of the cost of the hospitalized illness. Included in this average are the cost of physician services, nursing care, and other expenses, as well as hospital charges. It must be remembered that interviewers of the Bureau of Labor Statistics

Table 5. Percentage of all urban residents and of persons in urban families with medical care expenditures of \$1,000 or more with some health insurance coverage, by age group, 1950

| Age group (years) | Percent of all urban residents | Percent of persons in families spending \$1,000 or more |
|-------------------|--------------------------------|---|
| All ages..... | 60. 7 | 60. 9 |
| Under 6..... | 59. 1 | 57. 2 |
| 6-18..... | 60. 8 | 66. 3 |
| 19-44..... | 65. 3 | 66. 7 |
| 45-64..... | 62. 4 | 62. 8 |
| 65 and over..... | 36. 6 | 41. 3 |
| 65-74..... | 41. 8 | ----- |
| 75 and over..... | 23. 7 | ----- |

Tuberculosis Prophylaxis Trials in Preview

SHIRLEY H. FEREBEE, FRANK W. MOUNT, M.D., and CARROLL E. PALMER, M.D.

SINCE 1952 the drug isoniazid has been used widely and effectively in the treatment of tuberculosis. This demonstrated effectiveness in treatment has led to the idea that isoniazid may be effective as a prophylactic agent.

To say that isoniazid prophylaxis of tuberculosis is controversial is certainly not to exaggerate. Some believe it can prevent tuberculous infection from progressing to clinical disease or can even prevent infection itself. Others just as firmly believe it can prevent neither infection nor disease but instead will interfere with the acquisition of resistance. On the basis of these beliefs, the use of prophylactic isoniazid is either advocated or opposed.

Both these beliefs are based on analogy. Advocates draw support for their view from the results of the treatment of patients. Opponents base their position on animal experiments. No direct evidence of the effectiveness of isoniazid prophylaxis in human beings has yet been produced.

The Public Health Service finds itself unwilling, without direct evidence, to endorse the prophylactic use of isoniazid. It is equally unwilling, without direct evidence, to dismiss the possibility that isoniazid may be an effective prophylactic. In this dilemma, a program of carefully planned control studies involving large numbers of people seems the only solution. Consequently, the Public Health Service, with the cooperation of tuberculosis workers throughout the country, has initiated a series of prophylaxis trials.

The first of these trials was begun in January 1955. Its purpose is to see whether the frequency of complications of primary tuber-

culosis can be decreased by the prophylactic use of isoniazid. In this study, more than 2,500 children with asymptomatic primary tuberculosis are being observed in 31 pediatric clinics.

A second trial, in which local health departments are participating, is now getting under way. Health departments ordinarily keep under observation persons considered to be at greater than average risk of tuberculosis so that treatment can be started at the first sign of active disease. These persons are of two kinds: those whose risk is considered to be due to unusual exposure, that is, the household contacts of newly discovered cases of tuberculosis, and those who are considered at unusual risk because of suspicious pulmonary pathology observed on X-ray films but whose present condition does not require treatment.

For these "special risk" groups, the Public Health Service is helping health departments add the prophylaxis trial to their already established services. Household contacts make up the larger part of the study population. In addition to the usual "watchful waiting," half the persons in this trial are receiving daily isoniazid and the other half placebo.

Each participating health department tuberculin tests and X-rays the household contacts of each newly discovered case of pulmonary tuberculosis. Any contact with evidence of active tuberculosis is referred to his family physician or a tuberculosis clinic for treatment. The others are asked to enter the study.

The household is given a bottle containing a month's supply of enough pills for each adult member of the family to receive a daily dose of between 3 and 7 mg./kg. of body weight and for each child to receive a daily dose of between 5 and 10 mg./kg. Each month for the next 11 months, a member of the household picks up a new supply of pills at the health

The authors are with the Operational Research Section of the Tuberculosis Program, Division of Special Health Services, Public Health Service.

drug therapies (10, 11). However, improved medical procedures and therapies make for higher costs of care for other major illnesses, and the aging of the population increases the frequency of these illnesses.

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Health Survey in the Great Plains Area

Extensive study by the Public Health Service of health needs in sparsely settled rural areas started July 1, 1957, with a survey of the health situation in Kit Carson County, Colo. Counties in the Great Plains area have been selected for the study because there are few local health departments in that area to serve the widely scattered farm population, and because farm incomes there have been affected adversely by drought and other severe weather variations.

The Kit Carson study will cover more than 1,500 families, with cooperation from the Colorado State Department of Public Health, local physicians, and county leaders.

The R. E. Dyer Lecture



The Natural History of Plague and Psittacosis

KARL F. MEYER, M.D.

THE invitation to deliver the sixth R. E. Dyer Lecture is interpreted as an opportunity to appraise the past, present, and future of bacteriology and epidemiology in their relation to medicine. As the investigator honored by these lectures has so eminently shown, the study of infectious diseases still promises exciting discoveries, despite the advances of recent decades.

Immunization and antimicrobial therapy have certainly expanded man's control over many infections. Few who entered the fields of pathology and bacteriology 50 years ago could foresee the imminent reduction in the number of deaths from diphtheria, pneumococcal pneumonia, streptococcal infections, yellow fever, typhus, and plague. One keeps in mind the intelligence and devotion of those whose

work made this reduction possible. Some of their work was brilliant; much more of it was simply intelligent. It was all invariably persistent.

The triumphant results of these efforts have led to the prevalent misapprehension that no one should now die of or even suffer inconvenience from an infection. The origin and consequences of this attitude are readily traceable from the success of chemotherapy of spirochetal and protozoan infection to the more dramatic experiences with sulfonamides and antimicrobial drugs. In many cases, chemotherapy has unquestionably eliminated the infector from the infected, allowing the infected to survive where once he would have perished. If a measure can preserve life, it may be unfair to point out its shortcomings, even its faults.

To comprehend the whole nature of the relationships of the new chemotherapeutic agents, the micro-organisms, and the infected human being is not so simple. Misleading simplifications abound in the minds of laymen and of physicians. But among microbiologists there is still much conjecture about the mode of action of these drugs.

The exceptional nature of the host-drug-parasite relationship is not always understood. Infectious agents do not characteristically submit to unconditional surrender. Throwing great quantities of every drug against every infection will insure only a steady decrease of satisfactory responses and a steady increase in toxic reactions, sensitized patients, and re-

Dr. Meyer is director emeritus of the George Williams Hooper Foundation, University of California Medical Center, San Francisco, and professor emeritus of experimental pathology at the university. He joined the staff of the Hooper Foundation in 1915 and was its director from 1924 until his retirement in 1954. Dr. Meyer's work in bacteriology and pathology has merited him many honors. Three times he has been given the degree of doctor of medicine honoris causa. Among his other awards are the Sedgwick Memorial Medal of the American Public Health Association, an Albert Lasker Award, and the Walter Reed Medal for distinguished service to tropical medicine. He delivered the sixth R. E. Dyer Lecture on February 19, 1957, at the National Institutes of Health, Public Health Service.

department and returns the previous month's bottle. The number of pills remaining in the bottle when it is returned is a clue to the regularity with which the family has been taking the pills.

At 3-month intervals during the year, a nurse from the health department visits the family and reports on the health of each family member the regularity with which the family is taking its pills, and the amount of time the member with tuberculosis has spent in the home.

At the end of the 12th month, the household members are reexamined in the clinic with tuberculin tests and X-rays.

The procedure is essentially the same for the tuberculosis suspects, except that the suspect, rather than his family, is the study member.

During the year each health department continues its usual observation of these tuberculosis suspects and household contacts. If one of them develops clinical tuberculosis, he is removed from the assigned medication and referred to his physician or tuberculosis clinic for treatment. The other members of the family continue to receive the assigned medication.

While this scheme is simple for any one household, its application to many households in a number of cities creates administrative problems for the central office in Washington. Most of the difficulties stem from our determination to make the observations as objective as possible. We believe it is critical that neither those who are taking pills nor those who are observing them should know whether a household is receiving isoniazid or placebo. Households receiving placebo must have the same faith in the usefulness of their pills as those taking isoniazid. The public health nurses must watch those who are taking isoniazid with the same concern they feel for those taking placebo. The physician who diagnoses tuberculosis in a household contact must not be influenced by the knowledge that a person has or has not been receiving isoniazid. The only way to make sure that the study is free from bias is to make the two products indistinguishable and to tell no one outside the central office what each bottle contains.

Bottles of pills labeled only with code numbers are sent to the health departments. They

are of the various sizes necessary to provide a month's supply of pills for families containing from 1 to 16 persons ranging from 2 months to more than 70 years of age. The health departments assign the initial bottles to the households and thereafter receive from the central office each month a new bottle for each family. The scheme is so arranged that half the households of each size receive isoniazid and the other half placebo.

It will not be known with any precision how faithfully people take their pills. The most we shall know is how many say they do, how many of them return each month for a new supply, and what the returned bottles indicate. If, at the end of the year, the isoniazid households should have as much tuberculosis as the placebo households, we would not know whether this is a failure of isoniazid or a failure to take the pills. But we would know that to distribute isoniazid as a prophylactic in the way it is being done in this study is not a useful tuberculosis control measure. If isoniazid households should have less tuberculosis than placebo households, we would know that this is a minimum difference, that prophylactic isoniazid is at least this effective. The inclusion of both positive and negative tuberculin reactors in the study population should provide a means of learning whether new infection can be prevented among the tuberculin negatives and whether new disease can be prevented among the tuberculin positives while isoniazid is being taken.

Each person will take pills for only 1 year, but he will be observed, at least at 6-month intervals, we hope, for a number of years. From this continued followup, we hope to gain some information as to whether isoniazid has any lasting effect on old infections and whether prophylaxis of the uninfected during exposure interferes with their resistance during subsequent exposure.

We recognize that the task of evaluating isoniazid as a prophylactic agent is formidable. Nevertheless, the consequences for the control of tuberculosis would be so tremendous should the drug prove effective, and the indirect evidence that it will work is so promising, that we feel obliged to try.

manifested in epidemics. The development of methods of investigating epidemics has made it possible to analyze newly discovered infections more efficaciously.

Initially, epidemiology was concerned with learning what maintained epidemic diseases. Medical bacteriology, fascinated by the rich rewards granted the unilateral search for new causes, at first failed to realize that infectious diseases are biological manifestations of parasitism. By placing the parasite in the foreground of the inquiry and by failing to consider as equally important the receptivity of the host to the parasite, the pioneers remained unaware of the full natural history of infection. Once it was recognized that most infectious diseases are characteristically asymptomatic, the strictly utilitarian concepts changed.

Today, the epidemiologist is less concerned with etiological specificity than with reactions between the infector and the infected. Study of the prime incitant of disease and tracing it to its natural environment share importance with appraisal of the spectrum-like individual, clinical, and immune variations within an infected group. Furthermore, the epidemiologist recognizes that knowledge of an infection in an individual patient is basic to comprehension of an epidemic. The broad field inquiries and experimental studies of the biology of infections indicate that the tragedy of individual events and the course of an epidemic are ultimately conditioned by innumerable variables in the constitution of the host and in the characteristics of the parasite. Study of both components of an infection must continue.

From this point of view, the contributions, even with respect to the parasite, which is more accessible to study than the host, seem modest. Bacteria and probably viruses are infinitely adaptable and versatile. Studies of bacteria and viruses have increased knowledge of their anatomy and physiology to the extent that the subject of bacterial heredity is topical. When it is argued whether bacteria have nuclei or reproduce sexually, difficulties arise about the precise use of these terms. This is not the place to enter into this controversy, but it can be said that bacteria contain material chemically akin to the constituents of the nuclei of plant or animal cells. This material is parti-

tioned among the dividing bacterial cells, but, more important, identifiable components of one bacterium can be assimilated by another and transmitted to the descendants of that other, producing a race with a structure and properties different from those of the parent organism. These facts are in full harmony with what has long been known: Bacteria vary and mutate.

Successive generations of bacteria may differ fundamentally from those that preceded them, and the physical and chemical effects expressed as virulence produced by a bacterial population, even in a defined environment, cannot necessarily be predicted on the basis of previous experience. This fact may be irritating to the pure scientist who has studied bacterial chemistry. He does not know what to make of fugitive micro-organisms that differ from one another even when they originate from a single cell in a chemically defined medium. Allowing for variation, mutation, such sexual activities as transduction and transformation, and the appearance of a new generation every 20 to 30 minutes, change in infectious agents in so inconstant an environment as man and animals should surprise no one. But physicians and patients are bewildered about why epidemics wax and wane, and about why this person is stricken and his neighbor is not.

No one can say whether knowledge of present epidemics can be used to explain the ebb and flow of past epidemics. Changes in the state and circumstances of the host alone certainly cannot explain the great cyclic variations in virulence over the centuries. Mutation of the parasite as conceived in very general terms is, at least in the modern view, a decisive factor. Mutation of the parasite toward greater invasiveness and virulence along with favorable conditions in the host opens the way to rapid proliferation and transfer for a time. But as the host is reduced in number, the parasite tends to be subdued because its field of action is narrowed. Natural selection apparently acts in favor of a more balanced relationship in which host and parasite survive with minor damage to either. The epidemic explosive phase is relatively short; the stabilized endemic, symptomless phase, relatively long. This may or may not explain fluctua-

sistant bacteria. It is now fairly well understood that insufficient amounts of the drugs may allow bacteria to survive treatment and that later the bacteria may multiply and cause a relapse. But it is not always understood that the organisms may not be easily reached by the drug and may therefore not be subjected to its adverse effects. Adequate elimination of the organisms may depend on continued administration of powerful drugs in large doses or on combined chemotherapy.

Use of the antimicrobials is not without dangers. To overlook or even deny the toxicity of some of the drugs leads to carelessness, misplaced enthusiasm, inevitable disappointment, and abuse of a useful tool. In order to use the extraordinary powers of the drugs to greatest advantage, one must recognize that some of the drugs are toxic, that they may lose their effect, and that they may even do harm unless those who administer them have a thorough understanding of bacteriology.

The dramatic early results of chemotherapy were not matters of chance. Fundamental research in bacteriology made the miracles possible, and day-to-day study has been necessary to keep them miraculous. When the new drugs were scarce, each patient to be treated was chosen with care and treatment was carefully controlled. This is an important reason why failures were few. Knowledge and understanding of the natural history and pathogenesis of infections must correct some of the grosser mistakes now being made. Adequately trained workers in good laboratories open to physicians in hospitals, in public health agencies, and in private practice are and will continue to be needed.

Other factors refute the prevailing view that infectious diseases have been conquered. These diseases have been significant through centuries, and they will continue to be so. The human race is condemned to coexistence with parasites. If they are underestimated they may regain their lost ground. The advances called to mind by the names Jenner, Pasteur, Lister, Koch, Roux, and Theobald Smith have altered the course of the infectious diseases quantitatively with respect to location and time. But the suppression of certain epidemic diseases in relatively small areas has in no way



Dr. Karl F. Meyer

influenced parasitism in general. The everlasting question, what forces create, maintain, and suppress epidemic diseases of man and animals? has never been fully answered.

From 1857 on, the work of Pasteur and those who followed him turned bacteriology from a conjectural into a scientific discipline. The impact on medicine was immediate, and it was with few exceptions one sided. The pathologist analyzed the gross and microscopic changes in the cadaver and interpreted these end results of the infection. The study of the causative agents as living creatures, rather than the disease process itself, created the field of microbiology, a field already so broad that no single scientist can hope to deal with it competently. Experimental methods have brought bacteriology and pathology together. This left another area to be explored by the epidemiologist. Field investigations, clinical records, and laboratory researches on individual patients were correlated in an effort to understand the mass phenomenon of infection and disease

unpurified antiplague horse serum were disappointing.

Later, during a visit to Ann Arbor, Mich., Prof. F. G. Novy described the dramatic experiences in San Francisco in 1901, where he had been a member of an expert commission on plague. Subsequently, a worker in his laboratory had contracted pneumonic plague. From 1913 on, I followed eagerly the plague investigations conducted by the Public Health Service first in California and later throughout the 15 western States. Opportunities for studying plague developed slowly, but since 1920 the disease has been one of my main interests.

Epidemics in California

The urban murine phase of plague in San Francisco, with at least 159 cases and 77 deaths, terminated in 1908, and the subsequently discovered reservoir in wild rodents of rural areas yielded few specimens for study. In fact, by 1914 optimists contended that all discernible plague had been eradicated. But official records after 1915 continued to report that plague-infected squirrels were being found around the bay area. Human infections apparently did not occur, and for a time a feeling of security prevailed.

Then, like a thunderbolt, rapidly fatal pneumonic plague struck in Oakland, between August 15 and September 11, 1919. The circumstances of the outbreak, in which 13 persons died, including 2 physicians and 2 nurses, were described and interpreted by Force and Kelly (1). The first patient, who had secondary plague pneumonia after incision of a bubo in the right axilla, had hunted and shot squirrels in the Alameda foothills. The customary search for squirrels with gross anatomical lesions led to a small reservoir.

It was necessary then to look into the intrinsic and extrinsic factors that conditioned the episode.

With respect to the causative organism, this outbreak was compared with the earlier devastating epidemic of pneumonic plague in Manchuria. Because of the violence of both, it was thought that the plague bacillus involved differed from the ordinary strains, that it was specific, highly virulent, and pneumotropic. In

both, lung lesions had been found in the responsible reservoir of wild rodents. It was believed that the respiratory infection was a mixed infection. Carefully planned experiments later showed the oneness of the plague bacillus, irrespective of host origin or symptoms. The strain isolated in the Oakland epidemic was not pneumotropic and differed neither biochemically nor serologically from the other continental strains.

Influenza interjected further diagnostic doubt. This disease had not entirely disappeared in August 1919, and the cause of death of one plague victim had been reported to be influenzal pneumonia. Methods of studying this virus had not then been developed, and the usual bacteriological tests on the lung specimen available did not answer the question.

The extrinsic factors in the Oakland outbreak had to be reconstructed from data collected after the epidemic. The temperature had been around 60° to 68° F. and the humidity low. Such climatic conditions would not favor the transfer of infected droplets carrying plague bacilli from one person to another, a fact suggesting that contact with the patients was probably close.

The climate was similar during October and November 1924 in another outbreak, this time in Los Angeles. There were 40 cases—29 pneumonic, 3 tonsillar, and 8 bubonic—and 35 deaths. Appearing in a few households, the infection was carried by visiting relatives or friends to other households, and these then became subsidiary centers for spread. An autopsy was performed in 9 of the 29 cases of pneumonic plague, and in 3 the evidence suggested contact infection through the oral or faucial mucosa. The significance of this type of infection was not known then. In 1926, Wu Lien-Teh reviewed 250 reported cases of pulmonary plague from various epidemics and mentioned tonsillar plague with primary cervical buboes in only 3 cases (2).

The epidemiology of the Los Angeles outbreak has never been critically analyzed, nor has an epidemiological report of it ever been published. On epidemiological grounds it is believed that secondary pulmonary invasion developing from bubonic plague of rat flea origin

tions in epidemic patterns. Since infection is a natural phenomenon, infectious agents are likely to take new forms, and milder or deadlier infections may arise from the usual pathogenic agents or from nature's vast reservoir of feebly pathogenic or nonpathogenic creatures.

Infections do cross into regions where they were previously unknown, and they also may exist in unexplored areas. Man's entrance into uninhabited territories in quest of natural resources or land for agricultural development has led to the discovery of natural foci of zoonoses transmissible to man. These remain unrecognized until human beings come in contact with them. They constitute a potential danger, and their existence and localization should be anticipated.

How can a thoughtful student accept the view that the infectious diseases are losing their importance and that they will probably be conquered within a decade? Bacteriology and virology, with their important components microbiology and immunology, as cornerstones of epidemiology have made great contributions to medicine, public health, and preventive medicine. There are still challenges to the younger generation to apply effectively what is already known and in an adventurous spirit to decline acceptance of all prevailing views and incline to exploration of the remaining unknown. It has always yielded to determined, qualified investigators.

The laboratory worker observes that the number of specimens being received is growing and that the methods and the interpretation of results are becoming more complex. There is an unsatisfied need for diagnostic work and for the kind of assistance that can be furnished only by a qualified bacteriologist and epidemiologist receptive to problems in infectious diseases.

It seems appropriate on this occasion to discuss the natural history of two infections on which the predecessor of the National Institutes of Health—the Hygienic Laboratory—did pioneer work in the United States. My friendship with Dr. Dyer stimulated my continuation of plague studies during the past 15 years. Earlier counsel of Dr. George McCoy led the way. And without the studies on psittacosis

in 1930 by McCoy, R. D. Lillie, H. E. Hasseltine, V. M. Hoge, and others, and the encouragement offered by the late Surgeon General Hugh S. Cumming, it is doubtful whether so extensive an effort would have been made to solve problems in California. In addition to the support given by the officers of the Public Health Service, perhaps sentimental ties with the country of my birth fostered my interest in these two infections. The cause of plague was first conclusively demonstrated by A. Yersin, a Swiss. Psittacosis was first described as a specific clinical entity by J. Ritter, another Swiss.

PLAGUE

Black Death claimed 14,000 inhabitants of the city of Basel between 1347 and 1353 and left its mark on many permanent records. Historical documents, religious ceremonies, and art treasures reminded later generations in that ancient city that plague was its worst visitation, surpassing war and famine in its impact. Family chronicles described the scourge and listed the medicaments that the head physician of the city hospital compounded by mixing 23 different herbs into what was called *agua theriacalis*. This I well remember because translation of one of these documents from Latin into German was one of my assignments in the gymnasium in Basel.

At the time of that translation, the cause of plague had just been discovered, and the infection was embarking on its pandemic march out of Hong Kong. Perhaps nothing among the reminders left a greater imprint on my mind than a canvas by Boecklin, the famous Swiss painter, shown in the Basel gallery in 1897. Here the horrible feeling of the epidemic is conveyed by grotesque, triumphant Death, astride a monster, hurtling through a street.

While a graduate student at the Institute for Infectious Diseases in Bern, I assisted in the active immunization of horses with virulent plague bacilli. This experience provided ample opportunity to become acquainted with the plague cell and with procedures for guarding against infection. Efforts to develop a test on rats that would reveal the protective and, to a lesser degree, the curative properties of the

vectors are obviously far more complex than they were once thought to be.

Influenced by the work of Baltazard, other workers have proceeded to find centers of wild rodent plague in Kenya, central Africa, and the United Provinces (Uttar Pradesh) in India. Heisch, while studying plague near Rongai in the Rift Valley of Kenya, found a focus in three different species of wild mice in a certain field (11). *P. pestis* was isolated from these rodents long after the widespread epizootic had died down and the animals in adjacent fields were proved by animal tests to be free from infection. After the field was ploughed up, infected rodents could no longer be found, but "permanent foci" persisted in the escarpments where rodent burrows were relatively undisturbed. The ecologically unstable plains are ideal for dissemination of *P. pestis* when conditions are suitable, but the infection retreats to the foothills between epizootics among the highly susceptible domestic rats.

According to studies supervised by Baltazard at the recommendation of the Expert Committee on Plague of the World Health Organization, the endemicity of plague in India is similar to that in Kurdistan, Kenya, and other parts of the world. It is due to an effective disease reservoir, not in rats, but in certain wild rodents, in particular in bandicoots (*Tatera indica*).

The geographic origin of plague has given rise to much speculation and much argument, and it has been hoped that bacteriology would eventually settle the issues. The glycerol reaction of a large collection of *P. pestis* strains has recently been restudied, and some interesting differences have been observed. The glycerol-positive strains, designated continental, are perpetuated in wild rodents in the old pestilence centers: southeast Russia, central Asia, Mongolia, Manchuria, Transbaikalia, and central Africa. The strains that apparently originated in the pandemic in Yunnan, China, in 1894 are glycerol negative and have been designated oceanic. These have been found in Kenya and in certain parts of the United States. One would expect the strains in the ports of Texas to be the pandemic glycerol-negative strains, but 3 of 29 strains isolated

there from rats and 2 from patients were glycerol positive. Whether the glycerol reaction solves the nosographical problems is a question to be answered by further critical studies and interpretations.

Pathogenesis of the Infection

Nothing can happen in an epizootic or an epidemic that has not already been founded in a single infection. It is always important to understand the pathogenesis of bubonic, or zootic, and pulmonary, or demic, plague in experimental models, usually the mouse or the guinea pig. The pathogenesis of the infection after the introduction of *P. pestis* through the bite of a blocked infectious flea can be readily followed in these animals. It follows a standard pattern: afferent lymphatics to regional lymph nodes, to efferent lymphatics, to thoracic duct, to blood stream, to liver and spleen. When the bacteria multiply to such an extent that the liver and spleen can no longer filter them out, they appear again in the circulating blood. Active multiplication of *P. pestis* in the bloodstream, so essential to infection of the flea, is always terminal.

In this connection, the nature of septicemic plague should be clarified. As commonly defined, septicemic plague is a form of the disease in which, owing to the magnitude of the infection or to the low resistance of the host, the regional lymph nodes are overrun and the blood stream is immediately invaded. Because the infection is progressing so rapidly, the reactions taking place in the lymph nodes are overshadowed by the general condition of the patient or animal. What is considered primary septicemic plague is really bubonic plague in which the buboes are inconspicuous.

For these reasons it seems preferable to distinguish between two main types of human plague: the primary bubonic, or zootic, form and the primary pulmonary, or demic, form.

The spread of the infection in the immunized animal is similar to that in the unimmunized animal, differing from it only quantitatively. The organisms reach the bloodstream early, but they are destroyed so effectively that only isolation of the bacilli from the bone marrow testifies to the transient hematogenous spread.

started the epidemic. The recrudescence of rat plague in that area was a great surprise. Surveys begun in 1908, when an infected squirrel caused a human infection, and carried through until 1915 had revealed no infected rodents. Two possible sources of the infection in Los Angeles rats in 1924 were investigated: (a) infection in rats brought in from foreign ports through San Pedro, the port of Los Angeles, and (b) infection in ground squirrels in the area.

The first possibility was dismissed because plague-infected rats could not be located in the port. The second possibility seemed to fit the circumstances. The rats in that area did have contact with squirrels; infected squirrels were found in the urban section of the city; and squirrel fleas were found on the rats. The interchange of fleas between wild rodents and commensal rats had been recorded earlier (3-5) and has been observed since (6).

Wild Rodent Reservoirs

An ecologic study in 1946 on a ranch near Santa Paula, roughly 50 miles northwest of Los Angeles, established for the first time the simultaneous occurrence of plague in rats, ground squirrels, a cottontail rabbit, and their ectoparasites (7). One-fourth of the fleas taken from the rats were ground squirrel fleas carrying *Pasteurella pestis*. Plague was probably also transmitted from wild to commensal rodents in the rat epizootic in Tacoma, Wash., in 1942 and 1943.

Interestingly, rat plague has never been recorded inland in the western States. Not only are there fewer rats inland, but also there is no evidence that ectoparasites from other wild rodent reservoirs are transferred to the rat.

Recurrence of plague in commensal rats in countries where the principal natural reservoirs are squirrels and gerbils without notable repercussions in nearby human populations has not been adequately explained. The idea that commensal rats are the sole reservoir was based on observations that without exception domestic rats and the classic plague-bearing flea were abundant where bubonic plague was epidemic. Whether this combination is responsible for epidemics in India, Madagascar,

Egypt, Senegal, Peru, Brazil, and elsewhere now requires thorough reevaluation.

As late as 1940, investigators familiar with plague in South America believed that natural infection of wild rodents was confined to Argentina. Then wild rodent foci were found in Venezuela, Bolivia, Peru, and Ecuador (8, 9, and personal communications from Macchiavello). At first the investigators believed that the infection was not entrenched in smoldering wild rodent foci, but more recent observations indicate that it is.

In the brilliant investigation of the epidemiology of plague in Kurdistan Province in Iran, Baltazard and his associates discovered two pockets in which the reservoir included three species of sand rats (10). These rats were the most numerous rodents near the foci where there had been two explosive outbreaks of pneumonic plague. Since some of these rats were resistant to plague, they would not be likely to be wiped out by epizootics, but they could serve as reservoirs of enzootic plague. It is becoming apparent that the highly susceptible rodents, such as the marmot, the squirrel, and the rat, are not the permanent reservoirs of the plague bacillus. In his picturesque description, Baltazard states that if the rat has made the fortune of plague, it is not the original, probably not even the actual, proprietor of the disease, but only the disseminator.

It was once assumed that whenever a parasite brings about its host's death in a short time, the host is not the natural one or that it is a natural one in some unnatural environment. Now Baltazard's findings suggest that that concept may have to be modified: In Kurdistan some sand rats were quite resistant while others were highly susceptible to plague. Only analysis of the chromosomes, not of gross zoological characteristics, would permit the necessary distinction in susceptibility. As Baltazard has pointed out (in a personal communication), it now seems that maintenance of plague in focal areas requires resistant wild rodents capable of surviving the epizootics and thus of perpetuating the infection, as well as susceptible species capable of rekindling the infection. The ecologic factors in the focal habitual niches filled with hosts, parasites, and

vectors are obviously far more complex than they were once thought to be.

Influenced by the work of Baltazard, other workers have proceeded to find centers of wild rodent plague in Kenya, central Africa, and the United Provinces (Uttar Pradesh) in India. Heisch, while studying plague near Rongai in the Rift Valley of Kenya, found a focus in three different species of wild mice in a certain field (11). *P. pestis* was isolated from these rodents long after the widespread epizootic had died down and the animals in adjacent fields were proved by animal tests to be free from infection. After the field was ploughed up, infected rodents could no longer be found, but "permanent foci" persisted in the escarpments where rodent burrows were relatively undisturbed. The ecologically unstable plains are ideal for dissemination of *P. pestis* when conditions are suitable, but the infection retreats to the foothills between epizootics among the highly susceptible domestic rats.

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The marked lung involvement regularly found in the absence of spleen or liver lesions in partly resistant or immune animals and in man dying after prolonged illness has not been satisfactorily explained.

This lacuna in our knowledge should be filled. Secondary lung involvement leads to cough and copious expectoration and often to pneumonic plague epidemics. Without knowing exactly what the mechanism is, one has to depend on epidemiological observations. Travelers who fall ill with bubonic plague before leaving an infected locality or en route therefrom are particularly prone to secondary lung involvement. Muscle efforts made by such people may cause detachment of infected thrombi from blood vessels around the buboes and may lead to lung embolism. Malnutrition and such extrinsic factors as cold and rainy weather may all contribute to impairment of resistance. Guinea pigs or squirrels surviving acute experimental plague for at least 6 to 10 days invariably have extensive secondary lung involvement.

At first it was believed that circulating toxin reduces the resistance of the lung tissue, just as staphylococcal toxin does (12). But guinea pigs and squirrels are quite resistant to the toxin. Mice and rats rarely have secondary pulmonary plague lesions. It is unlikely that the scattered foci of necrosis result solely from lowered resistance induced by toxin. Their location beneath the pleura suggests that they are initiated by bacterial emboli arrested in the arterioles and capillaries. In partially immune guinea pigs and naturally resistant ground squirrels, rapid mobilization of agglutinins favors embolus formation; agglutination promotes clumping of plague bacilli in the vascular beds. It is always striking that in the animals with secondary lung involvement the spleen and liver are singularly free from necrosis. Why neither the microphage nor the lymphoid-macrophage defense system is functioning effectively in the lung while it operates in the spleen and liver remains unanswered.

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Transmission of Pneumonic Plague

During studies on immunization of monkeys against pulmonary plague, healthy animals were exposed to cage mates with frank primary pneumonic plague in order to learn something about the contagiousness of the disease. A monkey (*Macaca mulatta*) infected by the intratracheal route and reacting with fever and definite roentgenologic evidence of pneumonia was placed in a cage with a healthy monkey. To learn whether *P. pestis* was being exhaled from the nasal passages of the infected animal, blood plates were held before its nose for $\frac{1}{2}$ to 2 minutes at the time the healthy animal was put in the cage. In this interval, from 2 to 66 organisms were exhaled onto the plates. The healthy monkeys were left in the cages until the infected ones died: for from 2 to 72 hours. Of the 18 exposed, 9 contracted septicemic and 3 bubonic infection.

The procedure was then refined by confining the 2 monkeys in a large cage divided into 2 separate compartments by a coarse wire barrier. Bodily contact was thus eliminated, and a situation was created in which any exchange of *P. pestis* was through airborne droplets alone. Of the 8 exposed in this manner, 4 contracted septicemic infection.

Clinical and X-ray examinations and blood cultures demonstrated that primates exposed, with or without body contact, to cage mates suffering from primary pulmonary plague may contract plague and die. The rapidity of the course of the infection, the negative X-ray findings, and the early positive blood cultures in 13 of 16 successful transmissions left no doubt that the exposed animals died of "septicemic" plague. There was very little visible involvement of the lymph nodes. Systematic autopsies confirmed the clinical findings, but careful dissections invariably showed that the

superficial and deep cervical lymph nodes were slightly enlarged, hemorrhagic, and imbedded in edema. The lungs showed no consolidation; congestion and edema were at first glance interpreted as patches of pneumonia. Only 3 of the 26 exposed monkeys had pulmonary plague in the form of lobular foci extending to lobar involvement. Two of the animals with septicemic plague and no involvement of the lungs had ulcerations in the stomach and jejunum and buboes in the adjacent lymph nodes.

The gross anatomical lesions of the lymph nodes incriminated the upper part of the respiratory tract as the portal of entry of the plague bacillus, but generally there were no characteristic changes of the oral or faucial mucosa. Some congestion and swelling of the tonsillar region were noted in some animals. Examination of serial sections of the entire nasopharynx of six animals disclosed that the lymphatic tissues forming the ring of Waldeyer surrounding the oropharynx were the likely portal of entry of the organisms. Enormous masses of plague bacilli were embedded in the severely altered lymphoid tissue on one side, rarely on both sides, of the tonsillar sinns. The so-called tonsillar lymph nodes adjacent to the diseased lymphoid tissue invariably had the characteristics of primary plague buboes. As a rule, the palatine and faucial tonsils were not markedly involved. Clumps of plague bacilli were numerous and scattered through the epithelial layers of the pharynx. It is not unlikely that swallowing these clumps of bacilli led to the gastrointestinal lesions.

Two observations from these studies are of particular significance: Plague was transmitted through infectious droplets from primates with pulmonary plague; the apparent septicemic plague was bubonic tonsillar plague with cervical buboes. Most epidemiologists have believed that primary pulmonary plague is caused by an infection entering through the deeper portions of the respiratory tract, but a few, especially Kulescha (13), have considered the possibility that the organisms enter through the tonsils or other parts of the upper part of the respiratory tract and are then carried to the lungs by the blood stream. This idea was dismissed at one time with the state-

ment that experimental observations did not support it.

Recent experiments by Druett and his associates (14) in which infection was introduced by means of bacterial clouds are most instructive. Two forms of plague, both originating in the respiratory tract of the guinea pig, developed, the form depending on the size of the particle conveying *P. pestis* to the host. Particles no larger than 1 micron initiated a bronchopneumonia that terminated in septicemia and death. Larger particles, 12 microns in diameter, deposited in the region of the head penetrated local epithelium and through the afferent lymphatics led to septicemia much earlier than occurs with organisms deposited on the bronchial or alveolar wall.

The monkeys infected by their sick cage mates suffered from the form of disease found in animals exposed to large-particle clouds, namely, septicemia arising from a primary focus of infection in the cervical lymph nodes with infarction, but no pneumonia. Attempts to establish an epizootic by cross-respiratory infection were abortive, probably because of the nature of the disease developing in the first cross infection.

Thus certain epidemiological observations are now partly clarified. What has been seen in man has been reproduced in animals.

Chemotherapy

The value of the antimicrobial drugs in treatment of plague has been soundly documented (15). In fact, one is justified in stating that it should be possible to cure any plague infection without complications if it is treated soon enough. Light and moderately severe bubonic plague infections have been cured in India with sulfathiazole, sulfadiazine, and sulfamerazine. The most spectacular effect of antiplague chemotherapy was that observed in Madagascar where pneumonic plague was treated with streptomycin, chloramphenicol, and tetracycline drugs (16). The overall curative effects were so impressive that failures in treatment, particularly in modern hospitals, were not anticipated.

A recent experience with a patient suffering from bubonic plague clearly teaches, however,

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The stabilized association of birds with the basophilic elementary body psittacosis agent extends over such a wide geographic area and involves so many species of birds that it is hard to imagine that it has existed only as long as it has been known. Maintenance and transfer of the virus is assured by the flocking and nesting of birds. Fulmars, petrels, domestic and wild pigeons, chickens, ducks, and turkeys, birds that congregate and nest together, are hosts of viruses related to, but immunologically distinct from, the psittacine serotypes. The virus is rarely if ever found in species of more solitary habits. Under ordinary circumstances few birds die of the disease.

All observations on psittacine infections are consistent with the hypothesis that low-grade psittacosis has been enzootic for many years among Australian budgerigars, or shell parakeets, and among the more common wild South American and Australian parrots. Psittacosis was undoubtedly imported with the original breeding stock first into England and then into nearly every country of the world. The enzootic infection in parakeets bred in Europe and America in all probability derives from the natural infection of the Australian budgerigar from which these parakeets are descended. However, this does not necessarily mean that the virus did not exist elsewhere in the world at that time.

Course of the Infection in Birds

The course of the infection in the wild bird population has not been studied extensively. This focus has rarely given rise to known human infections; man does not ordinarily associate with wild birds closely enough to endanger his health. It is necessary to resort to analogy to describe what may be the natural course. Under stress of egg laying and hatching, the hen with latent infection excretes virus through the alimentary canal. Susceptible nestlings contract the infection; most of them recover and some become carriers. It seems likely, too, that the virus goes through periodic phases of increased virulence, and if an adequate number of birds is susceptible, an epizootic may result. The uncertainties of an outdoor climate may contribute to spread of the

infection. This leaves unexplained the occurrence of the infection in widely separated areas in birds that do not migrate. It may be found eventually that the virus is not so exotic or so tropical as it once seemed.

It is not surprising that the best known segment of the natural history of psittacosis is the infection in an unnatural niche: the parakeet-breeding aviary. When the parakeet is bred and raised in captivity in large numbers under conditions that differ radically from those of the Australian bush, the host-parasite relationship undergoes some changes. The parasite itself apparently behaves differently. The virus strains isolated from acutely infected cage birds have been distinctly more virulent than most isolates from acutely infected Australian parakeets. Occasionally, epizootics have killed 5 to 10 percent, sometimes an even higher proportion, of flocks in aviaries or pet shops.

During the acute infection the organism abounds in the diarrheal droppings and nasal secretions, and through these the parasite is conveyed to young birds. Some latently infected hens under stress of egg laying and hatching have excreted the virus more frequently and possibly in higher concentration than have latently infected hens not under this stress. Birds less than 6 months old are then the likely victims of the disease. The greater susceptibility of immature parakeets under experimental conditions and in aviaries is conclusively proved. The outcome of the infection in some maturing birds is asymptomatic infection grossly evident only in an enlarged infected spleen. This enlargement probably indicates that the parakeets have been infected but have suppressed or completely eliminated the infecter. The latent infection rates have ranged from 5 to 80 percent in aviaries and pet shops.

Factors in Resistance

Resistance is an important factor in the natural history of psittacosis, and most of what is known of it has been learned through experimental studies and observations on the course of the infection in aviaries. Here again no single factor can be given credit; heredity, age, and previous infection all participate.

Certain birds have an innate resistance to

that there was still something to be learned. The patient had hunted in an area where a wild-rodent epizootic had been in progress. A plague pustule developed on his right ankle, and a corresponding inguinal bubo appeared. Other symptoms arose on the third day after exposure. He was then treated with penicillin, and the diagnosis was established and bacteriologically proved by lymph node puncture and blood culture on the fourth day after onset. Treatment consisted of administration of 2 gm. of streptomycin and dihydrostreptomycin, 2 gm. of terramycin, 4 gm. of sulfadiazine, and 600,000 units of penicillin every 24 hours. One week after onset, 3 days after specific treatment had been instituted, the patient died. The autopsy, conducted by two pathologists, one an expert in plague, proved all the tissues to be free from *P. pestis*; *Candida albicans* was present in the right and left lungs. Microscopic examination furnished evidence of activity of a potent toxin: edema of the myocardium, liver, and lungs, and nephrosis associated with hemorrhagic nephritis. It is well known, for instance, in diphtheria, that "serious inflammation" is entirely due to toxin of the causative organism.

The investigator of experimental plague is continuously impressed with the fact that the most effective drugs may kill the bacilli in the blood, liver, spleen, and bone marrow and reduce the number of viable bacilli in the focal lesions of the lymph nodes or lungs. Despite this remarkable therapeutic feat, however, the animals ultimately succumb, probably because of the damage done by the plague toxin (15). During the chemotherapy studies in Madagascar, a patient with pulmonary plague was not treated until the 48th hour of disease and died after 40 hours of therapy with chloramphenicol. At post mortem her tissues were free of *P. pestis*, and the death was ascribed to toxin.

Efforts to understand this intoxication and its treatment have been only partly rewarding. Potent antisera containing antibodies against both infection and toxin have ameliorated this damage in mice, but not in monkeys. In more recent preliminary studies on mice with the *P. pestis* strain isolated from the California patient, streptomycin was indeed highly bactericidal; in fact, this strain was

more rapidly lysed by a combination of streptomycin and penicillin than was the control strain. When treatment with doses comparable to those used on the patient was begun late in the infection, animals died even though their tissues were completely free of *P. pestis*. That the deaths were probably attributable to the toxin was indicated by the observations that the effectiveness of the antimicrobial drugs was increased by from 15 to 50 percent when one dose of purely antitoxic serum was administered. This serum had a very high toxin-neutralization index and was completely devoid of demonstrable antibodies against infection.

Some of the basic knowledge essential to production of such an antiserum is available. Experiences in the United States with production of antiplague rabbit gamma globulin can readily be used to manufacture the amounts that might be required as an adjunct in treatment of the relatively few cases recognized in enzootic foci.

This leads back to some of the general thoughts expressed at the beginning of this lecture: Throwing great quantities of every drug against every infection without proper guidance by the laboratory will insure only the type of complications described here. As long as there are places where infections are spread to man, fundamental research in infectious diseases, efficient diagnostic services, and cooperation between the physician and the laboratory are essential to advances.

PSITTACOSIS

It once would have been said with confidence that the largest reservoir of psittacosis is the wild psittacine birds of the tropics: Australia, New Zealand, Mexico, and South America. But the list of wild birds in which the infection has been found has lengthened almost every time the virus is sought, and the continuing revelation of ornithosis in domestic poultry—pigeons, chickens, ducks, and turkeys—raises the question of its origin. Right now it is impossible to fit the fragments of information together. The answers cannot be found in sample serum surveys or virus isolation studies carried out in a single group of wild birds in a small area in a single season.

ected against infection by chemotherapy whenever exposure is suspected. A program aiming at the distribution of psittacosis-free birds, readily identifiable by characteristic leg bands, may be achieved if the bird-breeding and bird-distributing groups cooperate wholeheartedly.

The Disease in Nonpsittacine Birds

With respect to psittacosis arising from non-psittacine birds, epidemiological histories invariably report that the patient handled sick or visibly diseased carcasses of birds or was exposed to a flock that at the time of exposure or shortly before contained sick birds. The pathogenicity and virulence of the strains isolated from pigeons, chickens, and ducks and from the patients who have contracted the infection from them have been low for mammals and highly susceptible avian species. Most infections caused by these strains are inapparent. Despite the extent of the avian reservoir, the human infections are mild and infrequent. Few of numerous attempts to convert these distinct serotypes into more virulent strains by repeated passage through mice or ricebirds have been successful.

In pigeon lofts and poultry yards exchange of the parasite is similar to that in parakeet aviaries, but the balance is disturbed in favor of the parasite less frequently than it is among crowded cage birds in aviaries. It has occurred in young birds and in flocks that have been inadequately fed, poorly housed, or crowded (21).

Now a new ecologic problem has arisen. Infections among poultry workers and rendering plant employees comprise 398 (nearly a fourth) of the 1,687 human psittacosis cases reported in the United States in the past 5 years. These have been due to exposure to anatomically diseased poultry, principally turkeys. Enough isolations have now been made from diseased and apparently healthy turkeys raised in different parts of the United States to warrant consideration of the ecology of this phase.

Certain virus isolates from the fibrin-coated air sacs, peritoneal lining, pericardium, and blood of turkeys that had succumbed to natural infection have been exceptionally virulent for mice and guinea pigs. Sometimes they have

induced fatal infection within 48 hours, and when injected intravenously in the high dilution of 1:1,000, they have formed a highly potent toxin that kills white mice. Only 2 virus isolations have been made in the 398 human cases. These were identical to the turkey strains in their intense virulence. In outbreaks in Texas, New Jersey, and Oregon highly virulent isolates from the viscera of poultry have been identical to those isolated from these two plant workers in Texas and Oregon.

Random examination of spleens of apparently healthy turkeys not involved in human outbreaks in Texas, California, and Michigan have yielded seven isolates belonging to the psittacosis group. On primary isolation they were of low virulence for mice and guinea pigs. Two became virulent after repeated mouse passage, and in dilutions not exceeding 10^{-5} they fatally infected mice. However, they retained their low toxicity and did not fatally infect guinea pigs. Despite numerous passages the remaining five isolates retained their low virulence for mammals.

Several isolates were derived from a flock of turkeys in California in which mortality had not been undue. When the first part of the flock was processed, the hearts and livers of some birds were condemned because they were visibly diseased. The remainder of the flock was serologically tested, and 83.5 percent were positive. Of 88 employees who had handled the diseased poultry, the serums of 3 gave complement fixation reactions indicative of previous exposure to agents of the psittacosis group. None of the employees gave a history of illness. The serums of residents and employees on the turkey ranch where the infected flock was raised did not react in the complement fixation test.

This single observation does not justify the conclusion that the turkey ornithosis serotypes of low mammalian virulence are equally harmless to man.

Results of indirect complement fixation tests indicate that many flocks have been infected, but since the infections were mainly latent little is known of them. At this preliminary stage of the inquiries, it seems that natural infection of low virulence in turkeys resembles that in Australian parakeets and some pigeon flocks.

psittacosis and do not become infected. The proportion of naturally immune birds varies from flock to flock. It may be low, for example, in parakeet-breeding flocks that are being inbred for certain feather coloring.

Age seems to condition resistance to some extent. Liability to fatal infection declines with age, but susceptibility remains fairly constant. Highly toxic isolates induce symptoms in only a few adult parakeets; less toxic ones induce only transient symptoms or latent infection. Within 30 days about 25 percent of infected adult birds have eliminated the invading parasite from their tissues.

In the early days, when symptomatic disease was the only criterion of infection, it was thought that parakeets that had been experimentally infected and had then recovered had a strong immunity to infection. This is supported by the apparent immunity of a large proportion of the adult population of aviaries in endemic areas. It is further supported by the high susceptibility of flocks that have been successfully kept infection free and by the resistance of treated birds a month after artificial infection. Accidental introduction of infected birds into aviaries, cages, or zoological gardens may be followed by fatal, but more frequently by latent, infections. How long the resistance manifested in a small group of treated birds would persist one cannot say. Infection unquestionably does provoke immunity; there is a specific acquired antigen-antibody immunity. It is the duration of the immunity that varies from bird to bird.

And the effectiveness of any of these factors varies according to the vigor of the infecter.

Control Methods

When latent infection becomes epizootic in an aviary, usually some departure from good husbandry and cage hygiene has taken place. Formerly, only destruction of diseased birds brought the epizootics under control. A great deal can be said in favor of attempting to control the disease, despite its infrequent occurrence in man, and with the knowledge available it should be possible to eliminate the infection from aviary breeding stock. Until this major undertaking can be achieved, the proper han-

dling of shipments and distribution of birds in the retail trade would reduce and possibly eliminate some major sources of human psittacosis. Chemotherapy will serve as one of the most effective instruments.

That drugs inhibit multiplication of large viruses of the psittacosis-lymphogranuloma venereum group was first demonstrated with the lymphogranuloma venereum virus and the sulfonamides (17). Not all strains are equally sensitive, and it is the exceptional strain of the psittacosis agent that is susceptible. Aureomycin and terramycin are effective against the psittacosis virus because they prevent initial-body formation and almost completely inhibit growth, but they do not destroy the virus. Since 1950 the curative effect of these antibiotic drugs has been well established.

If adequate amounts of the drugs are given for an adequate time, at least 10 days, the mortality rate is less than 1 percent. If the disease is not treated, the rate is 20 to 40 percent. The lifesaving ability of the tetracycline drugs is spectacular in comparison with that of penicillin (18). The difference can be readily explained. Penicillin arrests cell division, but the organisms continue to grow and abnormally large forms develop (19, 20). The effect of the tetracycline compounds is more profound, for it includes inhibition of growth.

In large-scale field trials acute infections have been suppressed within 4 to 8 days, and 98 to 100 percent of latent infections have been cured with daily doses of 1.0 to 1.5 mg. of oxytetracycline, chlortetracycline, or tetracycline (a total of 15 to 30 mg. per bird). Intramuscular administration of the antimicrobial drugs is laborious and, if carried out on infected birds, exposes the injector to the risk of infection. The successful impregnation of hulled millet, sunflower seeds, or peanuts with tetracycline now allows administration of the drug in a uniformly acceptable and stable feed. This method is the most convenient way of suppressing the reservoir of human infections.

It must be remembered, however, that birds free from infection are still susceptible. Offspring from an aviary stock free from psittacosis are highly susceptible to acute psittacosis, and the infection, of course, may become latent. Treated flocks and their offspring must be pro-

ected against infection by chemotherapy whenever exposure is suspected. A program aiming at the distribution of psittacosis-free birds, readily identifiable by characteristic leg bands, may be achieved if the bird-breeding and bird-distributing groups cooperate wholeheartedly.

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The gross anatomical lesions observed in the processing of the flock of subclinically infected birds mentioned above suggest that this strain was more virulent than the usual strains of low virulence.

There has been little opportunity to study the natural history of ornithosis in the turkey flocks responsible for the explosive outbreaks of human illness in processing plants. In only a few instances is there opportunity to follow the course of epizootics. The epidemiologist encounters the end result of the epizootic on the processing line. Naturally, he speculates on possible sources of infection.

Since the droppings of the acutely diseased birds contain the parasite in abundance, it is no surprise to find 50 to 80 percent of a flock are seropositive within a few weeks. However, while knowledge of the pathogenesis and course of the infection in the turkey is still so sketchy, one has few leads to what initiates and promotes the epizootic. The parasite may be introduced into the flock by wild birds, by other turkeys, through eggs, contaminated feed, or biologics, or even by visitors to the ranch. For incubator-hatched and artificially brooded poultry, the nest infection chain does not exist. Ecologic investigations such as those made in the parakeet-breeding establishments must be undertaken and extended over several years before the natural history of the disease in turkeys will be understood.

Ornithosis in turkeys is of growing interest to large groups: consumers, flock owners, poultry industries, agricultural agencies, poultry processors, labor unions, insurance companies, health agencies, and biologists. Each component has something to gain if methods of control can be worked out. If control were to be approached by all concerned in an investigative and determined spirit, it seems credible that something could be done. No one can predict at this time how serious the problem may become.

Summary

The age of the biological phenomenon of parasitism is at least that of recorded history. For centuries, man's survival has been chaotically interfered with by the infectious diseases,

in pandemic form dramatically. In the last half century, man, through his intelligence and diligence, has begun to control this chaos effectively for the first time. The host's reaction against certain parasites is being fortified by immunization, and the life of certain parasites is being destroyed by antimicrobial drugs. These advances are good cause for great rejoicing. They are not cause for believing that parasitism holds no further challenge to man's ingenuity.

Very few parasites depend solely on man for their survival. Even if all the people of the world could be immunized, it would be an oversight of the characteristics of biological processes to hope that the infection concerned would thereby be banished from the earth. Immunization, which in some infections protects even the eagerly susceptible, usually must be repeated in the individual and certainly with each new generation. Effective chemotherapy must wait until the host is manifestly affected adversely by the parasite. Both of these defenses, magnificent but temporary, leave the parasite free to carry on its usual latent existence untouched: to multiply, to adapt, and to exert its capricious effects on the host.

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Johns Hopkins University to Revise Medical Curriculum

A revised program of medical education, which will reduce the period of study and emphasize the humanities, is scheduled to begin at the Johns Hopkins University School of Medicine in the fall of 1959. The plan cuts 2 years from the training period for a carefully selected group of students and shortens the course for others by 1 year.

A total of \$10 million was granted by the Public Health Service, the Ford Foundation, the Rockefeller Foundation, the Commonwealth Fund, and by other private sources for the construction of a new basic science building and for additional faculty.

Program objectives are to shorten formal medical education without sacrifice of quality; to overcome the barrier between the liberal arts and the medical sciences; and to encourage students to follow careers in the basic medical sciences, such as physiology, anatomy, and pharmacology, in which there is the greatest shortage of teachers and research workers.

Candidates with adequate "motivation and

maturity" who have completed 2 years of college will be permitted to enter medical school, where they will pursue a 5-year course. During the first 3 years of medical school, they will continue studies in the liberal arts, at the end of which they will receive the bachelor of arts degree.

Students accepted after 3 or 4 years of college will begin medical school with the second year of the 5-year program.

For all students the last year of medical school will be combined with the first year of internship at the Johns Hopkins Hospital. In addition to 24-hour responsibility for patients, the student will have a 2-month elective period for work in the basic sciences or further clinical training in any of the hospital departments.

Although the years of medical training are reduced, with a consequent cut in medical education costs, the actual period of training is shortened relatively little. The academic year is increased from the present 32 weeks to 40 weeks; the fifth year covers 50 weeks.

The Manchester Variety Of *Shigella flexneri* 6 Isolated in Kentucky

D. J. SCHLISSMANN, M.S., W. T. COOLEY, M.S.,
and ROBERT RABIN, Sc.D.

THE Manchester variety of *Shigella flexneri* 6 has been found to be prevalent among the normal population of preschool children in the coal mining region of eastern Kentucky. In diarrheal disease studies conducted by the Cumberland Field Station of the Public Health Service's Communicable Disease Center, this strain was isolated one or more times from 69 children during a 20-month period.

To our knowledge, no previous reports of the identification of the Manchester variety in the United States have appeared in the literature, although several investigators advise us that the strain has been isolated in this country. W. H. Ewing of the International Shigella Center in Atlanta, Ga., has confirmed the identification of this strain, which was isolated by L. F. Ey and C. C. Croft of the Ohio Department of Health during a disease outbreak in Mansfield, Ohio, in July 1949. In this outbreak, 9 infants died and 172 of the estimated 468 residents in an area of substandard homes gave a history of being ill. Ewing has said also that the Manchester variety has been isolated in Louisiana, and W. W. Ferguson of the Michigan Department of Health has reported identification of the strain in his State.

Mr. Schliessmann is chief of the Cumberland Field Station, Communicable Disease Center, Public Health Service, West Prestonsburg, Ky. Mr. Cooley is currently in charge of laboratory services of the Berea College Hospital, Berea, Ky., and Dr. Rabin is currently with Smith, Kline, and French in Philadelphia.

*Dr. W. H. Ewing of the International Shigella Center, Atlanta, Ga., confirmed the identification of 98 *Shigella flexneri* 6 isolations (5 Manchester and 3 Boyd 88) and 22 other *Shigella* isolations reported in this paper.*

The Manchester variety is one of three presently known biotypes of *S. flexneri* 6. In 1925 Clayton and Warren isolated the first biotype from the feces of a girl suffering from diarrhea in Newcastle, England (1). Later, these workers obtained similar organisms during a small epidemic of diarrhea in a children's home (2). The mannitol negative, aerogenic bacillus described by them, subsequently named the Newcastle dysentery bacillus, was serologically related to other *S. flexneri* serotypes. Hardy and others (3) have reported that the Newcastle variety is the cause of acute diarrheal disease in England, India, Africa, and South America.

In 1933 Downie, Wade, and Young (4) described organisms which they isolated from five diarrheal cases near Manchester, England, and from a mild case of dysentery in a Nigerian laboratory worker. These organisms were serologically identical with the Newcastle bacillus, but differed biochemically in their ability to ferment mannitol aerogenically. They became known as the Manchester variety of *S. flexneri* 6.

A third biotype, which has been designated the Boyd 88 strain, was first reported from India by Boyd (5, 6). The organisms he described were aerogenic, fermented mannitol, and were serologically identical to the Newcastle dysentery bacillus. The pathogenicity and recovery of the Boyd 88 biotype have been reported throughout the world.

Scott (7) has shown that the bacilli of Boyd 88, Manchester, and Newcastle are all serologically identical.

Material and Method

One phase of the diarrheal disease studies in the coal mining region of eastern Kentucky is the collection each month of rectal swab specimens from normal preschool children in selected mining camps and rural populations. Specimens are obtained at the homes in the manner described by Hardy and Watt (8), by inserting a sterile cotton swab into the rectum. Immediately after withdrawal from the rectum the swab is used to streak a *Shigella-Salmonella* (Difco) agar plate and is then placed in a tube of tetrathionate broth. The

inoculated plates are subsequently incubated at 37° C. in the laboratory, and typical colonies are picked to triple sugar iron (TSI) agar at 24 and 48 hours. The swab in tetrathionate broth is incubated at 37° C. for 24 hours and then streaked on brilliant green agar plates, which are then incubated. Colonies typical of *Salmonella* are picked to TSI agar at 24 and 48 hours. Biochemical and serologic examinations of organisms suspected of being *Shigella* or *Salmonella* are performed as described by Edwards and Ewing (9).

Results

During a 20-month period, September 1954 through April 1956, *Shigella* organisms were isolated from 272, or 3.3 percent, of 8,392 specimens obtained from normal preschool children. As shown in the tabulation below, the most prevalent type encountered was *S. flexneri* 6, which represented 43 percent of all *Shigella* isolations. Of the 118 *S. flexneri* 6 isolations, 95 percent were Manchester and 5 percent were Boyd 88 biotypes. *Shigella sonnei*, representing 22 percent of the total *Shigella* isolations, was the second most prevalent type. Seasonal peaks in *Shigella* isolations occurred in the fall and early spring, with the proportion of the Manchester variety to all other shigellae remaining fairly constant.

| | Number of isolations |
|---|-------------------------|
| <i>S. dysenteriae</i> 2----- | 7 |
| <i>S. flexneri</i> 1b----- | 24 |
| <i>S. flexneri</i> 2a----- | 26 |
| <i>S. flexneri</i> 3----- | 5 |
| <i>S. flexneri</i> 4a----- | 33 |
| <i>S. flexneri</i> 6, Manchester variety----- | 112 |
| <i>S. flexneri</i> 6, Boyd 88 variety----- | 6 |
| <i>S. sonnei</i> ----- | 59 |
| Total----- | 272 |

The 112 positive isolations of the Manchester biotype were obtained from 69 children in 52 families. The organism was isolated once from 48 children, twice from 14 children, 3 times from 1 child, 4 times from 1 child, 5 times from 4 children, and 9 times from 1 child. In 12 children the organism was recovered in 2 consecutive months, and in 2 it was recovered for 3 and 6 successive months respectively. In

seven children the bacillus was recovered twice with a negative culture during the intervening month. From 4 children a second recovery occurred after 2 negative monthly cultures, and from 1 child a second isolation was obtained after 3 successive negative cultures.

Discussion

In view of the few reports of the occurrence of the Manchester biotype in the United States, the high prevalence of the organism in normal populations in Kentucky is striking. The findings may be of particular significance to epidemiological and laboratory workers. It is possible, of course, that the situation in these somewhat isolated communities is not duplicated elsewhere, but it is also possible that the organism is actually more widespread in this country than the paucity of reports would indicate.

Biochemical reactions of the Manchester bacillus are atypical in comparison with the reactions of the other shigellae in that they ferment glucose and mannitol with the production of gas. The Manchester biotypes encountered were nonmotile and did not utilize citrate, produce indol, or hydrolyze urea. Lactose, adonitol, and salicin fermentations were negative. The organism consistently fermented glucose and mannitol, with production of gas in both carbohydrates. Glucose fermentation is of particular significance to diagnostic laboratory workers since reactions in TSI agar have been used as one of the principal biochemical screening tests in enteric bacteriology. Gas is formed by the Manchester bacillus in TSI and Kligler's agar slants in small to moderate amounts frequently sufficient to rupture the media. Therefore, cultures showing an alkaline slant and acid butt with gas should not only be considered as possible "paracolons" or non-H₂S-producing salmonellae, but also should be checked as this biotype of *S. flexneri* 6. The Boyd 88, the Manchester, and the Newcastle biotypes cannot be differentiated by serologic tests with absorbed antisera since they are serologically identical. Final identification and differentiation of the biotype is dependent upon both biochemical reactions and slide agglutination with absorbed antisera.

Of the 21 children in this study with more than one infection, approximately one-half were members of families in which their preschool siblings became infected, thereby providing ample opportunity for intrafamilial reinfection. For example, M. C. and E. C. are 2- and 9-year-old sister and brother. M. C. was Manchester positive on specimens taken in July, November, and December 1955, and again in March and April 1956. E. C. was positive in August, September, and October 1955, and again in February and March 1956. Since the Manchester bacillus was found only once in 70 percent of the children infected and since there was ample opportunity for reinfection in children having infections for consecutive months, the duration of infection presumably averaged about 1 month. This period is consistent with previous observations by Watt and his co-workers (10) on the duration of the carrier state for the *S. flexneri* group.

Summary

Two biotypes of *Shigella flexneri* 6 have been isolated from normal preschool children in eastern Kentucky. Of 272 *Shigella* isolations obtained from specimens taken September 1954 through April 1956, 112 (41 percent) were Manchester bacillus and 6 (2 percent) were the Boyd 88 variety.

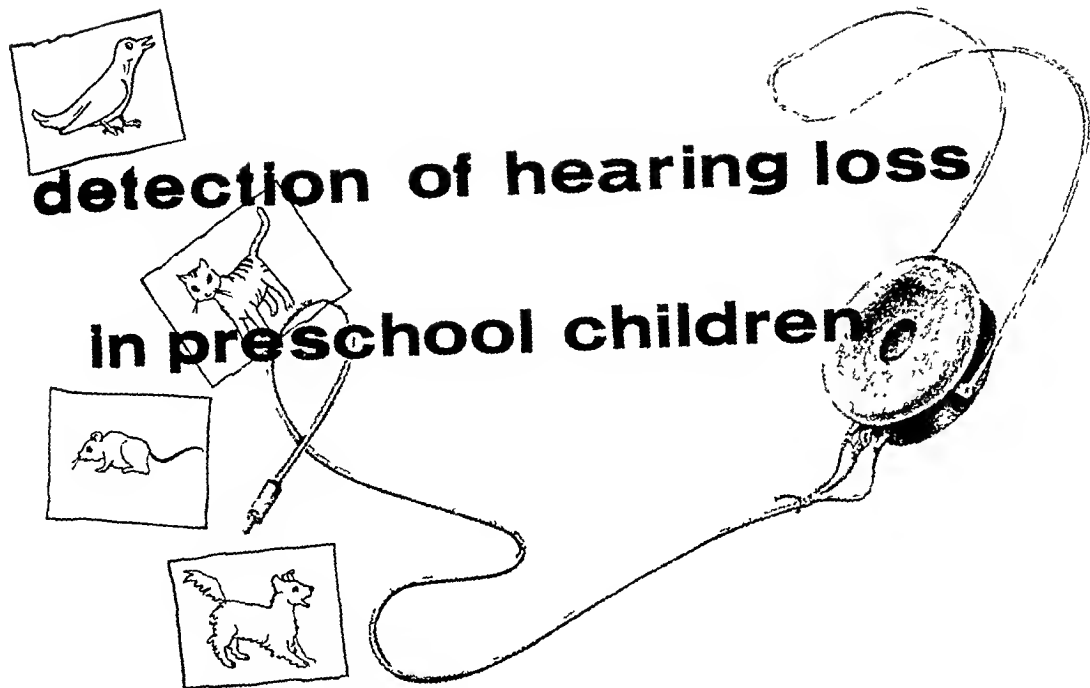
Attention is called to the atypical biochemical reactions of the Manchester bacillus in comparison with other *Shigella* and to the possibility that this biotype is more widespread in this country than is currently believed.

The average duration of the carrier state appears to be approximately 1 month, which is

comparable to duration of infection of other *S. flexneri* types.

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detection of hearing loss in preschool children

MARGARET L. GEYER, M.S., and ALFRED YANKAUER, M.D., M.P.H.

AN INDIVIDUAL pure tone sweep check has proved relatively effective in mass screening preschool children for hearing loss in a study in Rochester, N. Y. A great majority of the children were screened successfully, and threshold tests confirmed hearing loss in about half the screening failures. The screening test, an adaptation of the sound toy test described by Myklebust (1), requires a minimum of equipment and time.

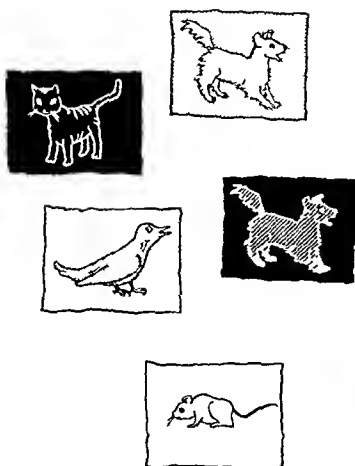
The advantages of finding cases of hearing loss in preschool children have long been recognized. Speech training is most effective if begun before the child is of school age; progress of the hearing loss may be arrested by early treatment; and school adjustment is facilitated by knowledge of the child's capabilities on admission to school. However, mass testing of preschool children has not been generally undertaken, primarily because of doubt whether it could be done efficiently. Although a wide variety of methods for testing hearing of young children has been devised, none has been generally accepted as completely satisfactory for mass screening.

Because of the wide variation in procedures recommended for testing hearing in preschool children, the Rochester study was designed with a twofold purpose: (a) to work out a simple but effective hearing test for mass screening of an apparently well preschool population using readily available equipment and (b) to judge the value of mass screening with the test from the standpoint of case finding and time required to carry on the program.

Material and Method

Children in the study were drawn from those attending guided observation play groups or parent cooperative nursery groups housed in 10 public schools, those enrolled in 3 private

Miss Geyer, an audiologist, has been with the Rochester Board of Education, Rochester, N. Y., since 1945. Dr. Yankauer, at one time deputy health commissioner of Rochester, has been director of the bureau of maternal and child health, New York State Department of Health, Albany, since 1952.



For the speech reception test, the child points to an object when he hears it named.

seated at a table 3 feet from the loudspeaker. On the table were toys representing the above-named objects. In a practice session with live voice, the procedure was explained to the child. The phonograph recording was then played at a level about 30 db above the child's pure tone threshold. Speech reception threshold was determined by attenuating to a level where the child could point correctly to the toys 50 percent of the time.

The otological examination consisted of inspection of nasal passages, pharynx, and tympanic membrane.

Medical recommendations were made by the otologist of the Rochester Health Bureau, Dr. Lawrence J. Nacey. Educational recommendations were the joint decision of the otologist, a consultant in speech and hearing therapy of the Rochester Board of Education, Dr. Roland J. Van Hattum, and the tester. All screening and threshold testing were done by Geyer.

Results

A total of 461 children ranging in age from 2½ through 5½ years were given the initial screening test. The test appeared to be beyond the ability of 8 children (1.7 percent) who were suspected of being mentally retarded, and 22 children (4.8 percent) could not be tested

because of shyness, fear, or negativism. The percentage of children who could not be screened varied from 12.3 percent at age 2½-3½ to 3.3 percent at age 4½-5½ (table 1).

Fifty-three of the 431 children (12.3 percent) successfully tested failed the initial screening. All but three of these failures were given the second screening test. Twenty-eight children failed the second screening test, and all 28 (6.5 percent of the total group followed) also failed the threshold test. No significant relationship between test failure and age of child is apparent (table 2).

All the children whose hearing was within normal limits at 500, 1,000, and 2,000 c.p.s. in one or both ears on the second screening or

Table 1. Unsuccessful sweep check testing, by age

| Age | Total children in study | Screening unsuccessful | |
|----------------------|-------------------------|------------------------|---------|
| | | Number | Percent |
| 2 yr 6 mo-3 yr 5 mo | 65 | 8 | 12.3 |
| 3 yr. 6 mo-4 yr 5 mo | 213 | 16 | 7.5 |
| 4 yr. 6 mo-5 yr 5 mo | 183 | 6 | 3.3 |
| Total | 461 | 30 | 6.5 |

¹ Includes 8 children with possible mental retardation and 22 children whose cooperation could not be elicited.

Table 2. Results of screening 428¹ preschool children, by age

| Age | Number of children screened | Failed first screening test | | Failed second screening and threshold tests | |
|------------------------------|-----------------------------|-----------------------------|---------|---|---------|
| | | Number | Percent | Number | Percent |
| 2 yr. 6 mo.-3 yr. 5 mo.----- | 56 | 9 | 16.0 | 5 | 8.9 |
| 3 yr. 6 mo.-4 yr. 5 mo.----- | 195 | 19 | 9.7 | 7 | 3.6 |
| 4 yr. 6 mo.-5 yr. 5 mo.----- | 177 | 22 | 12.4 | 16 | 9.0 |
| Total----- | 428 | 50 | 11.7 | 28 | 6.5 |

¹ Does not include 3 children who failed first screening test but who were not given subsequent tests.

the pure tone threshold test (according to the above-mentioned standard) obtained a speech reception threshold equal to or 5 db lower than that obtained by first- and second-grade children with normal hearing on whom the system was calibrated. However, whereas the latter performed the test until it was completed, the children in our study, especially the 3- and 4-year-olds, sometimes lost interest and had to be recalled to the task. For children with bilateral loss on the pure tone threshold test, the binaural average was determined. The difference between the speech reception threshold and the best binaural average of the pure tone threshold varied from 2 db to 15 db, with a mean of 11 db. In general, it was felt the two thresholds were in close enough agreement to confirm each other.

Medical care was recommended for 19 of the 28 children who failed the pure tone threshold test. Speech reading was recommended for 1 other child and considered as a future possibility after reevaluation for 3, 2 of whom also had medical recommendations. Thus specific medical or educational recommendations, or both, were made for 21 children, 5 percent of the total group followed.

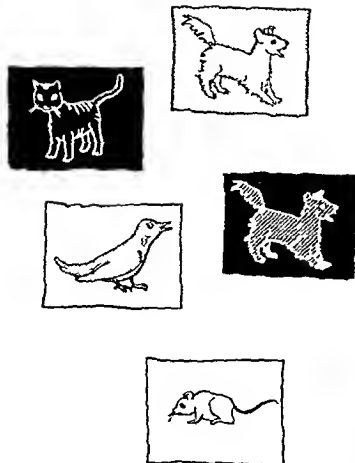
According to a record of the time it took to condition and screen each child, the average time per child was 5½ minutes.

Discussion

The findings of this small study indicate that mass screening of preschool children is a worthwhile public health procedure. Of 431 apparently well children, 6.5 percent were found to have a valid hearing loss, and medical or educational recommendations for treatment were made for most of these. The screening test proved successful with the vast majority of the children, and it was a fairly accurate case finder with a relatively low rate of overselection.

It should be emphasized, however, that it is one thing to screen preschool children but quite another to obtain an accurate threshold test on them. While both procedures require patience, testing experience, understanding of young children, and keen observation on the tester's part, the former can be performed quickly and is simply a matter of the child's indicating whether or not he hears the tone. Obtaining a true threshold of hearing (not of interest) for each frequency poses a real problem. Myklebust (1) has pointed out the improvement in response as the child grows older. For example, he found that the mean threshold reading at 1,000 c.p.s. for children between 3 and 3½ years (6 ears) was 14.16 db, in comparison with 3.50 db for children between 5 and 5½ years (10 ears). This point has been brought out also by Westlake (6): "Children of 3 and 4 years of age show less consistency in their response to the pure tone tests and show a wider deviation from accepted normal thresholds than the older ones do, but these are very probably due to other factors than auditory acuity."

A final point to be made in discussing hearing screening programs, particularly when they involve very young children, is the significance of the child's response or inability to respond to the hearing test itself. Lack of response is a revealing symptom of the child's total behavior, and if persistent it should be followed up by more complete audiologic and neuropsychiatric evaluation in a diagnostic center. Since many retarded children have central auditory perceptive problems, accounting for inability to respond to a screening test on the basis of mental retardation is not justified.



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seated at a table 3 feet from the loudspeaker. On the table were toys representing the above-named objects. In a practice session with live voice, the procedure was explained to the child. The phonograph recording was then played at a level about 30 db above the child's pure tone threshold. Speech reception threshold was determined by attenuating to a level where the child could point correctly to the toys 50 percent of the time.

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Pesticide Residues in Fluid Market Milk

PAUL A. CLIFFORD

DURING the fall of 1955, each of the 16 Food and Drug Districts submitted at least 100 samples of market milk to the Division of Antibiotics, Food and Drug Administration, Washington, D. C., where they were checked for residual antibiotics (1). In addition, 800 of these samples, 50 from each district, were analyzed by the Division of Food for pesticide residues.

Surveys in 1948, 1949, and 1951 had shown that traces of DDT could be found in about 25 percent of market milk samples. A fairly specific but somewhat long procedure, the Schechter-Haller method (2-4), was then available for detecting DDT, but more recently many other pesticides have come into use, and residues of lindane, technical BHC, methoxychlor, Rhothane, heptachlor, toxaphene, chlordane, members of the aldrin group, Perthane, Dilan, Lethane, and others might be encountered in milk. For most of these no specific test method exists. In addition to the group of chlorinated organics, trace residues of the organic phosphate pesticides, such as parathion, and Systox, might be found. A further complication was recognized from the start: Little is known about the metabolism of most of these products; some or all might degrade to unknown products of unknown toxicity.

Because of the dearth of specific methods, and because the application singly of the available ones to hundreds of samples would involve more work than a limited staff could handle, a bioassay "sort-out" test was applied. E. P. Laug of the Division of Pharmacology has perfected a bioassay with flies and applied it to the determination of DDT, lindane, endrin, and other pesticides (5-7). When only one toxicant is known to be present, the results can be made

remarkably quantitative. When the toxicant is unknown, or a mixture of toxicants is present, fly mortality gives a positive indication of their presence and, barring synergistic effects, at least some idea of the amount. Thus, the fly bioassay appeared to be well suited to routine sort-out work.

The Division of Pharmacology collaborated in this survey by running the fly bioassays on the prepared extracts of the milk samples. There were 801 samples in all. The Schechter-Haller method was later applied to a number of samples which tested strongly positive by bioassay, and paper chromatographic techniques were applied to these latter samples in order to identify the residues that caused mortality to flies (8).

Experimental Studies

All the chlorinated organic pesticides are fat-soluble and if present can be presumed to occur in the fat component of the milk. Sample preparation must thus involve the separation of trace quantities of the various pesticides from a relatively great quantity of butterfat. The fly bioassay cannot be applied directly to extracted butterfat; extraneous oily residues of more than about 20 milligrams will suffocate the flies. Further, there is a limit to the sensi-

Mr. Clifford is chief, Methods Research Branch, Division of Food, Food and Drug Administration, Department of Health, Education, and Welfare. Participating in the survey were the following FDA chemists: Paul A. Mills, William O. Winkler, J. William Cook, Alfred K. Klein, Lloyd C. Mitchell, Nancy Pugh, C. Richard Tamorria, John F. Tighe, Edwin P. Laug, and Frieda Kunze.

With these points in mind, it would seem realistic to recommend that careful mass screening be carried on with preschool children and that two successive failures to pass the screening test should be followed up by a pure tone threshold test. Referral to an otologist should be made on the basis of the threshold audiogram even though its complete accuracy may be questioned by the tester. The growth of nursery schools and organized play groups for children of preschool age should provide an accessible population for such a public health program.

Summary

In a study in Rochester, N. Y., an individual sweep check for hearing loss was successfully administered to all but 6.5 percent of 461 children from 2½ through 5½ years of age. Fifty of fifty-three children who failed the screening test were screened a second time. Twenty-eight of these children failed the second screening test and a subsequent pure tone threshold test. Thus 6.5 percent of 431 children successfully screened were considered to have a hearing loss. Medical or educational recommendations were made for 21 of them.

The average time required to condition and screen a child in this study was 5½ minutes.

From the standpoint of prevention, amelioration, and educational therapy, mass screening of the preschool population is worth while. The method described here appears to be one way of effectively and quickly screening this population.

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- (B) Western Electric, model 6 BP, Audivox, Inc., Boston, Mass.
- (C) Peters, model 23, Alfred Peters & Son, Ltd. Electron Works, 89 Arundel Street, Sheffield, England (distributed in this country by Sonotone Corp., Elmsford, N. Y.).

DOCUMENTATION NOTE

A bibliography of 25 articles on testing of hearing in young children has been deposited as document No. 5289 with the American Documentation Institute, Photoduplication Service, Library of Congress, Washington 25, D. C. A photoprint copy may be obtained by remitting \$1.25; a 35-mm. microfilm copy by remitting \$1.25. Advance payment is required. Make check or money orders payable to Chief, Photoduplication Service, Library of Congress.

mal purple to intermediate pinkish "off-shades." However, as they were due to DDT or related compounds, any one of these colors was called positive.

Organic Phosphate Pesticides

Each of the 801 samples was checked for organic phosphate pesticide residues by an *in vitro* cholinesterase inhibition test. Here again preliminary testing of methods by means of recovery runs with various organic phosphate pesticides was necessary. For the test, portions of the CHCl_3 extracts of the milk were brominated. This converts most thiono and dithio forms of phosphate pesticides to potent inhibitors. Extracts were then tested for inhibition by a ferric hydroxamate colorimetric method which measures residual acetylcholine (9, 10).

Results

On a countrywide basis the fly bioassay applied here revealed that 62 percent of the 801 milk samples contained pesticide residues (table 1). Most of the residues were in trace amounts that were not identified specifically. Thirty-

eight percent of the samples were called negative; 11 percent of the total number caused fly kills in excess of 10 percent but were classed as negative because characteristic toxic effects were not observed.

In the chromatographic results from 160 samples, DDT, DDE, BHC, lindane, DDD, and methoxychlor were identified in the milk chromatograms (table 2). It was not unusual to find as many as 4 of these in 1 milk sample. Members of the aldrin group were not encountered; nor were chlordane, toxaphene, and heptachlor. Technical chlordane and toxaphene are complex mixtures and both chromatograph as streaks instead of spots. It is possible that very small amounts of these or their metabolites may have escaped detection because the attenuated streak might not have registered on the chromatogram. DDA, a known metabolite of DDT, was likewise not found in the milk samples. The repeated occurrence of DDD may be somewhat surprising, but we are certain that the identification was positive. It may occur *per se* or as an impurity in technical DDT. It has not been mentioned as a metabolite of DDT.

Usually the chromatograms were clear cut

Table 1. Results of fly bioassay on milk samples, Food and Drug Administration survey, 1955

| Food and Drug District | Number of samples | Positive ¹ | | Negative ² | | Negative, but excessive kill ³ | |
|------------------------|-------------------|-----------------------|---------|-----------------------|---------|---|---------|
| | | Number | Percent | Number | Percent | Number | Percent |
| Atlanta..... | 50 | 24 | 48 | 26 | 52 | 8 | 16 |
| Baltimore..... | 51 | 29 | 57 | 22 | 43 | 5 | 10 |
| Boston..... | 48 | 27 | 56 | 21 | 44 | 10 | 21 |
| Buffalo..... | 50 | 24 | 48 | 26 | 52 | 5 | 10 |
| Chicago..... | 52 | 30 | 58 | 22 | 42 | 7 | 14 |
| Cincinnati..... | 50 | 28 | 56 | 22 | 44 | 6 | 12 |
| Denver..... | 50 | 29 | 58 | 21 | 42 | 4 | 8 |
| Kansas City..... | 50 | 29 | 58 | 21 | 42 | 3 | 6 |
| Los Angeles..... | 50 | 37 | 74 | 13 | 26 | 6 | 12 |
| Minneapolis..... | 50 | 27 | 54 | 23 | 46 | 5 | 10 |
| New Orleans..... | 50 | 43 | 86 | 7 | 14 | 5 | 10 |
| New York..... | 50 | 31 | 62 | 19 | 38 | 9 | 18 |
| Philadelphia..... | 50 | 28 | 56 | 22 | 44 | 13 | 26 |
| San Francisco..... | 50 | 41 | 82 | 9 | 18 | 0 | 0 |
| Seattle..... | 50 | 37 | 74 | 13 | 26 | 2 | 4 |
| St. Louis..... | 50 | 32 | 64 | 18 | 36 | 1 | 2 |
| Total..... | 801 | 496 | 62 | 305 | 38 | 89 | 11 |

¹ Test called positive, regardless of mortality, if flies showed toxic symptoms.

² No toxic symptoms observed.

³ No toxic symptoms, but kill greater than 10 percent.

⁴ Average.

tivity of the bioassay; as the test is conducted the flies will not react to, for example, much less than 5 micrograms of DDT. This amount of DDT would represent 0.05 p.p.m. for a 100-gram sample, and previous experience had shown us that amounts of this order were to be expected in some milk. Accordingly, it was necessary to develop techniques capable of separating microgram quantities of the various pesticides from 4 to 5 grams of butterfat. Good paper chromatograms likewise require that oily residues in the milk extracts be negligible.

Fly Bioassay

One-day-old flies from a special strain were employed. They were DDT-susceptible flies originally supplied by the Entomology Research Division of the Agricultural Research Service, U. S. Department of Agriculture, and maintained in the FDA Division of Pharmacology for about 10 years. Details of the bioassay may be summarized briefly: 1.30 gm. of flies (90 to 100 individuals), anesthetized with CO₂, were placed in flasks containing the milk residues plus 5.0 mg. oleic acid matrix and kept there overnight. A standard series, for example, 5, 8, 12.5, and 20 μ g. p,p' DDT plus 5.0 mg. oleic acid, and at least one blank flask containing only oleic acid, were also run (5-7). The percentage of mortality in all flasks was determined next morning.

It should be emphasized that mortality can be caused by factors other than the presence of pesticides; excessive fatty or waxy residues, while nontoxic in themselves, will suffocate the flies. Fortunately, flies exhibit a characteristic reaction to chlorinated pesticides, a well-defined dancing or jittering. In our experience, this characteristic symptom has as much, if not more, diagnostic value as the number of killed flies. The test was considered negative when the symptom was not observed.

In a number of samples, with no dancing or jittering, mortality was in excess of 10 percent. To avoid false positives such samples were reported as "negative, but excessive kill." It is possible that residual pesticides contributed to the high mortality and that characteristic toxic symptoms were missed during the overnight exposure periods.

Had only DDT been present, the mortality of the flies in the DDT standard flasks would have provided a means of assay. In this work, a "positive" indicated the presence of one or more unknown toxicants and, of course, some idea of the amount present. We had a few 100 percent kills. All positive fats were reserved for further work.

Chromatography

Paper chromatograms were run on the 160 milk fats, about 10 from each district, which exhibited the highest toxicity to flies. The general technique was that of Mitchell (8). Considerable preliminary work was necessary to determine the conditions under which all of the pesticides likely to occur in milk would separate on the chromatograms. Various solvent systems in varying proportions were tried: methanol-water, dioxane-water, acetone-water, and methyl Cellosolve-water. This latter system was finally selected, as it would separate DDT, which showed 2 spots for the 2 isomers of the technical product; DDE, the ethylenic decomposition product of DDT; DDD, or Rhothane; methoxychlor; lindane, or gamma BHC; technical BHC, which gave 2 spots, one due to the gamma isomer; and members of the aldrin group. Chromatographic separation of other pesticides—chlordane, toxaphene, heptachlor, Dilan, Perthane, and Lethane—was also investigated.

Schechter-Haller Method

One hundred sixty-nine of the milk fats exhibiting the highest fly kill, selected on the basis of about 10 from each district, were run by the Schechter-Haller colorimetric method. This method is not entirely specific for DDT; DDD, or Rhothane, the dichloro analog of DDT, interferes, as will Dilan to some extent. As the method is applied, methoxychlor and Perthane do not interfere, but various degradation products of DDT cause interfering colors (orange or pink). Technical DDT also contains about 25 percent of the o,p' isomer which yields an orange color instead of the distinctive purple of the predominant p,p' isomer. Thus, the test is only roughly quantitative; it was used mainly to confirm the chromatographic results. Actually, the colors produced ranged from a nor-

Table 3. Schechter-Haller test¹ on samples exhibiting the highest toxicity to flies, Food and Drug Administration survey of milk, 1955

| Food and Drug District | Number of samples | Number positive | Percent positive | Range as DDT (p.p.m.) |
|------------------------|-------------------|-----------------|------------------|-----------------------|
| Atlanta..... | 11 | 7 | 64 | trace-1.46 |
| Baltimore..... | 11 | 7 | 64 | traces |
| Boston..... | 11 | 6 | 55 | traces |
| Buffalo..... | 10 | 3 | 30 | traces |
| Chicago..... | 10 | 6 | 60 | trace-0.16 |
| Cincinnati..... | 10 | 3 | 30 | traces |
| Denver..... | 10 | 8 | 80 | trace-0.10 |
| Kansas City..... | 13 | 10 | 77 | trace-0.32 |
| Los Angeles..... | 11 | 10 | 91 | trace-1.20 |
| Minneapolis..... | 11 | 6 | 55 | trace-0.04 |
| New Orleans..... | 10 | 2 | 20 | traces |
| New York..... | 10 | 3 | 30 | traces |
| Philadelphia..... | 10 | 1 | 10 | 0.06 |
| San Francisco..... | 11 | 11 | 100 | trace-0.29 |
| Seattle..... | 10 | 4 | 40 | trace-0.08 |
| St. Louis..... | 10 | 2 | 20 | traces |
| Total..... | 169 | 89 | 53 | trace-1.46 |

¹ Reveals DDT and its decomposition products or metabolites, or both. DDD and Dihan are partial interferences.

Note: Trace represents approximately 3 µg. per 100-gm. sample or 0.03 p.p.m.

yield some anticholinesterase activity; however, as the work progressed to its conclusion, no more positives were found. Because of this, and especially in the light of more recent research on milk, these two seemingly positive results are now questioned. It seems unlikely that organic phosphate pesticide residues occur as such in present-day market milk.

Summary

1. More than 60 percent of 801 market milk samples collected in a countrywide survey in the fall of 1955 contained residues of chlorinated organic pesticides as indicated by the fly bioassay procedure used. Most of the residues were in trace amounts that were not identified specifically. The samples showing the highest kill of flies, about 21 percent of the samples, were examined by paper chromatography and by the Schechter-Haller method for DDT and related compounds.

2. One or more of the following, BHC, DDT, lindane, DDD (Rhothane), methoxychlor, and

DDE, have been identified by paper chromatography in some of the residues.

3. Market milk may contain up to 1.5 p.p.m. DDT or related compounds or both. Results by chemical methods, such as the Schechter-Haller colorimetric method must be accepted with caution unless interferences are known to be absent.

4. Two obvious sources of contamination of milk with chloro-organic pesticides are residues on forage and contamination as a result of insecticide sprays either on the cows themselves or in the barns and dairies. It is not known which of these is mainly responsible for the contamination. Work designed to settle this point is now in progress in the Food and Drug Administration.

5. Organic phosphate pesticide residues were not detected in these milk samples by an in vitro cholinesterase inhibition test.

(A limited followup survey conducted during the winter of 1956-57 by Atlanta, New Orleans, Los Angeles, and San Francisco districts revealed little or no contamination of market milk with either BHC or DDT.)

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Details of the methods used in preparing the samples and subjecting them to bioassay and analysis will be supplied by the Food and Drug Administration upon request.

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and easy to read; occasionally extraneous residues either streaked the chromatogram or produced diffused, fluorescent spots which, however, were distinct from the typical dark spots of silver formed by the chlorinated pesticides or their derivatives. An unidentified silver spot of low R_f value occurred in a large proportion of the samples, and a similarly unidentified spot of high R_f was occasionally noted.

An effort was made to concentrate the materials responsible for these two unknown spots and to check them for toxicity. A number of samples which gave both the high and low spots were composited and spotted on paper; after development the proper sections of the paper were leached and the residues exposed to flies. There was no detectable toxicity.

The ethylenic derivative of p,p' DDT, or DDE, was often noted in the chromatograms. Possibly it occurs in milk as a metabolite of DDT, but it could have resulted from the breakdown of DDT during storage and during the analytical process. In fact, possible decomposition of pesticides during transport and storage of the samples was one of our major worries; slight acidities caused by souring of the milk samples, or the development of free acids in the stored fats, could destroy pesticides of the

aldrin group. Possibly this is the reason these were not encountered.

In the 160 high mortality samples selected out of the 801 total, pesticides were found in the following order of incidence: BHC, 60 percent; DDT, 54 percent; lindane, 26 percent; DDD, or Rhothane, 24 percent; methoxychlor, 3 percent; DDE, either a breakdown product or metabolite of DDT, 36 percent. Usually the DDE spot occurred in conjunction with DDT, but occasionally it occurred alone.

About 53 percent of the high mortality samples, 89 out of 169, gave positive Schechter-Haller colors ranging from faint pink to deep purple (table 3). Read as p,p' DDT (600 $\mu\mu$), results ranged from a high figure of 1.46 p.p.m. on the basis of the original milk down to traces (about 3 μg per 100-gm. sample or 0.03 p.p.m.). The high figure is not accurate for DDT because DDD was also detected on the chromatogram of this sample.

In practically every case the colorimetric and chromatographic results were in at least qualitative agreement; sometimes the chromatogram registered a faint DDT spot for samples which gave no perceptible Schechter-Haller color.

In the early stages of the work we encountered two samples of milk which seemed to

Table 2. Chromatographic results on milk samples exhibiting the highest toxicity to flies, Food and Drug Administration survey, 1955

| Food and Drug District | Number of samples | Number of samples containing: | | | | | |
|------------------------|-------------------|-------------------------------|------|------|------|---------|--------------|
| | | DDT | DDD | DDE | BHC | Lindane | Methoxychlor |
| Atlanta..... | 8 | 7 | 3 | 0 | 7 | 1 | 0 |
| Baltimore..... | 11 | 6 | 4 | 3 | 4 | 3 | 2 |
| Boston..... | 10 | 5 | 1 | 3 | 6 | 0 | 2 |
| Buffalo..... | 6 | 3 | 3 | 2 | 5 | 1 | 0 |
| Chicago..... | 10 | 4 | 0 | 3 | 4 | 6 | 0 |
| Cincinnati..... | 11 | 1 | 2 | 1 | 7 | 2 | 0 |
| Denver..... | 10 | 8 | 1 | 5 | 5 | 5 | 0 |
| Kansas City..... | 13 | 4 | 2 | 5 | 4 | 5 | 1 |
| Los Angeles..... | 10 | 10 | 9 | 9 | 4 | 2 | 0 |
| Minneapolis..... | 10 | 2 | 0 | 4 | 8 | 2 | 0 |
| New Orleans..... | 11 | 7 | 1 | 5 | 7 | 2 | 0 |
| New York..... | 10 | 1 | 0 | 2 | 6 | 4 | 0 |
| Philadelphia..... | 10 | 2 | 1 | 1 | 2 | 8 | 0 |
| San Francisco..... | 11 | 11 | 10 | 11 | 10 | 0 | 0 |
| Seattle..... | 10 | 10 | 2 | 2 | 10 | 0 | 0 |
| St. Louis..... | 9 | 5 | 0 | 1 | 7 | 1 | 0 |
| Total..... | 160 | 86 | 39 | 57 | 96 | 42 | 5 |
| Percent of total..... | | 53.8 | 24.4 | 35.6 | 60.0 | 26.3 | 3.1 |

1956 Summary of Disease Outbreaks

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THE PATTERN of disease outbreaks in 1956, especially those which were waterborne or foodborne, did not differ materially from that of the previous 5 years. About the same proportion of waterborne and foodborne outbreaks occurred in schools, public eating places, and private homes. Likewise, many of the underlying causes, namely, poor food-handling practices, were mentioned as frequently in the reports for 1956 as in former years.

An examination of the reports of epidemiological investigations of disease outbreaks of all types during the year suggests that a considerable number were conducted with a minimum amount of effort on the part of the investigator. At the other extreme, some reports indicated that unusual occurrences of disease were investigated with meticulous attention to pertinent details.

Some investigations falling into the first category were limited in scope because the epidemic was brought to the attention of health authorities so late that a satisfactory report could not be made. Other outbreaks may have received scant attention because they were not considered to be important, and still others perhaps because trained personnel were not available for conducting investigations.

On the other hand, as there are each year, a number of reports of investigations were outstanding, although not all were concerned with diseases or illnesses of great public health importance. For instance, one widespread outbreak of typhoid fever was investigated and

reported in great detail, and the probable source of infection was determined. Other examples include a large number of human cases of psittacosis, occurring in one State, which were associated with turkeys; a foodborne outbreak of gastroenteritis in a high school; an outbreak of shigellosis traced to a water supply; and a number of investigations of single cases of a disease, including plague and suspected smallpox. Many of the investigations were conducted by teams of specialized personnel from local, State, Federal, and, occasionally, nongovernmental agencies. The various types of skills found in such teams might include those of medical officers, microbiologists, veterinarians, sanitary engineers, or entomologists. When the talents of such persons are brought to bear on a disease outbreak problem, it is probable that the underlying as well as the immediate causes will be brought to light.

Waterborne Disease Outbreaks

There was an increase in the number of waterborne disease outbreaks in 1956 compared with those of the past several years. In 1955, there were only two outbreaks with an unknown number of cases, probably less than 50. However, in 1956, there were 9 waterborne outbreaks of disease in which 1,719 persons were affected.

The 1956 outbreaks represent 2 rather large and 2 small outbreaks among persons who drank water from contaminated public systems. One outbreak involving about 800 persons was classified as shigellosis. *Shigella flexneri* was isolated from stool specimens from several of the patients. The specific organism was not found in the water, but an organism resembling shigella was isolated. There was

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Seventh International Cancer Congress

The Seventh International Cancer Congress, sponsored by the International Union Against Cancer, is scheduled for July 6-12, 1958, in London, England. Scientists and physicians are invited to submit previously unpublished or unreported papers on experimental or clinical aspects of cancer, or on cancer control. The deadline for registering without payment of late fee and for submitting papers is January 1, 1958.

A preliminary program and applications for registration and submission of papers may be obtained from either the Secretary General, Seventh International Cancer Congress, 45 Lincoln's Inn Fields, London, W.C. 2, England; or Dr. Harold F. Dorn, Secretary General, International Union Against Cancer, National Institutes of Health, Public Health Service, Bethesda 14, Md.

Travel allotments of about \$530 each are available to a limited number of scientists and physicians residing in the United States to cover air tourist fares on a special 15-day overseas round trip; a 6-day per diem allowance; and reimbursement for registration fee. Investigators invited to take part in one of the

symposiums before or after the congress may apply for additional funds.

Applications for travel allotments should be in the form of letters in sextuplet giving age, training, titles of publications in cancer or related fields, academic or professional title, and institutional affiliation. The letters should be countersigned by the department director or administrative officer. Applicants for travel allotments submitting papers to the congress must include 6 copies of an abstract not exceeding 250 words of each paper; those not planning to present papers should include 6 copies of a major, current investigative work. The letters and abstracts must be submitted before January 1, 1958, to the Chairman, USA National Committee on the International Union Against Cancer, 2101 Constitution Avenue, NW., Washington 25, D. C.

Applications for assistance toward travel expenses are entirely separate from applications for registration for the congress and for the submission of papers to the program committee. All applicants will be responsible for their own passports, visas, registration, travel arrangements, and hotel reservations.

poisoning and unspecified gastroenteritis. The sources of most of these outbreaks were not determined, but inadequate refrigeration was commonly a contributing factor permitting incubation of pathogenic organisms in food items.

As in previous years, poultry meat was most often incriminated in the outbreaks. Turkeys accounted for a large proportion and chickens for only a fraction of the total outbreaks. Beef, ham, and pastries were mentioned in almost equal numbers, about the same as in previous years. Potato salad was mentioned in only a few outbreaks but showed almost a five-fold rise over the number for the previous year, when outbreaks attributed to this item reached a low ebb.

Typhoid Fever

During 1956, there was an increase in numbers of cases of typhoid fever reported in the United States. Part of this increase was due to a relatively large number of cases which occurred early in the year in the North Central States. The fact that many of the cases were caused by one phage type (E_1) and that they were scattered over several States suggested that some article of food widely distributed through commercial channels might be the vehicle of infection. However, after an intensive investigation by State and Federal agencies, no common source of infection could be found. This widespread occurrence is not included in table 2.

Another group of persons became infected at one place but became ill in and were reported from several States. However, all of them are included in tables 1 and 2 as an epidemic originating in one State. Following a church camp meeting attended by several hundred people, 27 persons became ill after returning home. Epidemiological evidence indicated that water from a well at the camp site was the medium of spread. Furthermore, an epidemic of mild diarrhea which occurred during the camp meeting strengthened the belief that this supply of water was responsible for spread of the typhoid infection. It was determined that a typhoid carrier had attended the camp

and the organism isolated from her was the same type (C_2) as that isolated from the majority of the cases of typhoid fever.

Six other outbreaks consisting of only a few cases each were reported, all of them in association with carriers. Three were traced to contaminated food, and one was probably waterborne. A number of single cases for which epidemiological reports were received are not included in table 2.

Salmonellosis

Most of the 23 outbreaks of salmonellosis reported in 1956 were attributed to food, but in 6 outbreaks the vehicle of infection was not determined. Of the foodborne outbreaks, 4 were associated with turkeys, 1 with chickens, and 1 with ice cream. One outbreak of salmonellosis was waterborne.

Nine of the outbreaks were traced to carriers. In one outbreak, 521 persons in a mental institution became ill over a 10-day period. A food handler was found to be a carrier of *Salmonella newport*, but two organisms, *S. newport* and *S. typhimurium*, were isolated from stool specimens of cases traced to this source. Two other outbreaks were reported among persons patronizing establishments selling products to the public. In one of these, prepackaged chicken salad was the vehicle. A total of 323 cases were reported in connection with this outbreak, but the total number was estimated to be at least 3,000 symptomless infections in approximately 100,000 persons who were exposed to 28,000 individual cartons of chicken salad distributed over a 4-week period. Of 18 food handlers who had some contact with this salad, 5 were found to be carriers of *Salmonella blockley*. The second outbreak affected persons who ingested cream-filled cookies from a bakery that distributed this product in several western States. Of the remaining outbreaks, 5 were in universities and schools, 1 in a country club, 1 followed a community gathering, and several smaller outbreaks were in restaurants, labor camps, a farm, a bakery, and a club.

Two outbreaks of salmonellosis occurred in hospital nurseries for the newborn. *Salmonella oranienburg* was isolated in one such out-

substantial evidence that the city supply had been contaminated with raw water from a mountain stream. Evidence of fecal contamination was found along the stream, probably deposited there by campers known to have used the area. In another outbreak, about 700 persons in a small town became ill after the public water supply became heavily contaminated with surface drainage following a sudden rain storm. A third outbreak occurred in one section of a city. Here, the supply was contaminated by raw water from a stream being forced into the public water system by a sprinkler system pump of a resident living in the area of contamination. The fourth outbreak was traced to contamination of the water system during repair of a city main. When a ditch was opened about the main it filled with water from seepage, necessitating continuous pumping while the repair was being done. Although the line was flushed upon completion of the work, no sterilizing agent was used.

Three other outbreaks of gastroenteritis occurred in camps where untreated water was being used. In one camp, the local water company pumped raw creek water into the system because a well, ordinarily used as a source of supply, produced insufficient water during periods of peak demand. The remaining outbreaks were in two separate families whose water supply was private. In one family, *Salmonella typhimurium* was isolated from stool specimens, and the water in an old dug well was found to be contaminated. The outbreak in the other family resulted from poison being dumped into a well.

Three other disease outbreaks were reported in which water was suspected, but definite evidence was lacking. One was hepatitis (number of cases unknown) in a school. Another was among social workers at a gathering held in a place where new water pipes had been installed. It was reported that the pipes had not been flushed when the system was placed in operation. The third occurred in persons attending a church camp and is described under typhoid fever.

Milkborne Disease Outbreaks

The number of milkborne disease outbreaks also exceeded the number reported in 1955.

This is because 27 outbreaks of staphylococcal food poisoning involving more than 700 persons resulted from the ingestion of milk reconstituted from dry milk. Most of these outbreaks occurred among school children who drank United States surplus dry milk furnished through the school lunch program. No outbreak in 1956 was associated with pasteurized milk. Four cases of brucellosis occurred in a rural family who used raw milk from infected cows. Among customers of a restaurant, 80 persons became ill after eating a cheese sauce. Although none of the sauce was available for bacteriological examination, there was sufficient epidemiological evidence to incriminate it. The ingredients offered a rich media for pathogenic organisms, and the product was left at room temperature for 4 or 5 hours. The source of infection in two other outbreaks was traced to ice cream served at family gatherings, one of which was a picnic. In one outbreak, *S. typhimurium* was isolated both from the ice cream and from stool specimens of the patients. No source for either of these outbreaks was found. The second outbreak was believed to have been milkborne. Raw milk used in ice cream was considered to be the vehicle of infection. This, however, was not proved.

Other Foodborne Disease Outbreaks

The number (210) of foodborne outbreaks other than milk and milk products reported in 1956 is a little more than the 193 in 1955 but less than the 234 in 1954. This amount of variation suggests that no significant changes have occurred in incidence of these foodborne diseases in the past 3 years.

Most of the outbreaks were staphylococcal food poisoning, followed closely by unspecified types of gastroenteritis. A few miscellaneous organisms, including paracolon bacilli and streptococci, were found during the investigations of some outbreaks. Most of the outbreaks of typhoid fever and shigellosis, and almost half of the salmonellosis outbreaks were traced to carriers of the respective organisms who had handled or prepared food. Illness or infection was found in food handlers in a few of the outbreaks of staphylococcal food

Table 2. Foodborne, waterborne, and other disease outbreaks by type of infection, reported in 1956

| Area | Typhoid fever | | Salmonellosis | | Shigellosis | | Trichinosis | | Botulism | | Staphylococcal food poisoning | | Gastroenteritis | | Toxic agents | |
|----------------------|---------------|-------|---------------|-------|-------------|-------|-------------|-------|-----------|-------|-------------------------------|-------|-----------------|-------|--------------|-------|
| | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases |
| United States | 7 | 52 | 23 | 1,999 | 8 | 1,107 | 11 | 98 | 11 | 22 | 111 | 4,313 | 188 | 6,688 | 9 | 160 |
| New England: | | | | | | | | | | | | | | | | |
| Maine | 2 | 8 | 2 | 59 | | | 2 | 10 | | | 3 | 131 | 4 | 27 | | |
| Vermont | 1 | 2 | | | | | | | | | 1 | 91 | 1 | 7 | | |
| Massachusetts | | | | | | | | | | | 7 | 95 | 1 | 34 | | |
| Rhode Island | | | | | | | | | | | | | 1 | 24 | | |
| Connecticut | | | | | | | | | | | 1 | 20 | 3 | 142 | | |
| Middle Atlantic: | | | | | | | | | | | | | | | | |
| New York | 1 | 7 | 1 | 6 | | | | | 1 | 1 | 2 | 96 | 6 | 532 | | |
| New Jersey | | | | | | | 3 | 34 | | | | | 1 | 133 | | |
| Pennsylvania | | | | | | | 2 | 38 | | | | | | | | |
| East North Central: | | | | | | | | | | | | | | | | |
| Ohio | 1 | 6 | 1 | 9 | 1 | 12 | 1 | 2 | | | | | 5 | 718 | | |
| Indiana | | | | | 1 | 11 | | | | | 1 | 7 | 3 | 306 | | |
| Illinois | | | 3 | 131 | | | | | | | 7 | 206 | 1 | 200 | | |
| Michigan | | | | | | | | | | | 2 | 229 | 1 | 40 | | |
| Wisconsin | | | | | | | | | | | 1 | 11 | | | | |
| West North Central: | | | | | | | | | | | | | | | | |
| Minnesota | | | | | | | | | | | 2 | 56 | 1 | 46 | | |
| Iowa | | | | | | | | | | | 1 | 12 | | | | |
| Missouri | 1 | 27 | | | | | | | | | 2 | 220 | 3 | 31 | | |
| North Dakota | | | 1 | 9 | | | | | | | 2 | 72 | | | | |
| Kansas | | | | | | | | | | | | | | | 1 | 3 |
| South Atlantic: | | | | | | | | | | | | | | | | |
| Maryland | | | | | | | | | | | | | 1 | 152 | 1 | 10 |
| District of Columbia | | | | | | | | | | | 1 | 19 | 1 | 20 | | |
| Virginia | | | | | | | | | | | 4 | 102 | 1 | 44 | | |
| North Carolina | | | 1 | 200 | | | 2 | 12 | | | | | | | | |
| Georgia | | | 2 | 377 | | | | | | | 1 | 6 | | | | |
| Florida | | | 1 | 6 | | | | | | | 3 | 146 | 3 | 34 | 1 | 2 |
| East South Central: | | | | | | | | | | | | | | | | |
| Kentucky | | | | | | | | | 1 | 1 | 3 | 209 | 1 | 650 | 1 | 38 |
| Alabama | | | | | | | | | | | | | | | 1 | 60 |
| West South Central: | | | | | | | | | | | | | | | | |
| Arkansas | | | | | | | | | | | 1 | 40 | 3 | 418 | | |
| Louisiana | | | 1 | 38 | | | 1 | 2 | | | 1 | 6 | 3 | 648 | | |
| Texas | | | 1 | 100 | | | | | | | | | | | | |
| Mountain: | | | | | | | | | | | | | | | | |
| Montana | | | | | | | | | | | 1 | 700 | | | | |
| Idaho | | | | | | | | | 1 | 6 | 1 | 3 | 3 | 26 | | |
| New Mexico | | | | | | | | | | | | | 1 | 323 | | |
| Utah | | | | | 1 | 800 | | | | | | | | | | |
| Nevada | | | | | | | | | | | | | 1 | 25 | | |
| Pacific: | | | | | | | | | | | | | | | | |
| Washington | | | 1 | 135 | | | | | | | 2 | 117 | 2 | 47 | | |
| Oregon | | | | | 1 | 17 | | | | | 4 | 23 | 1 | 8 | 1 | 21 |
| California | 1 | 2 | 7 | 927 | 3 | 211 | | | 6 | 11 | 30 | 891 | 36 | 2,053 | 3 | 26 |
| Alaska | | | | | | | | | | | | | | | | |
| Hawaii | | | | | | | | | 2 | 3 | | | | | | |
| Puerto Rico | | | 1 | 2 | 1 | 56 | | | | | 1 | 16 | | | | |
| Virgin Islands | | | | | | | | | | | 21 | 579 | | | | |
| | | | | | | | | | | | 5 | 120 | | | | |
| United States 1955 | 5 | 36 | 16 | 971 | 10 | 475 | 5 | 92 | 5 | 14 | 102 | 4,130 | 66 | 5,160 | 5 | 99 |
| United States 1954 | 16 | 92 | 26 | 1,164 | 19 | 1,471 | 6 | 53 | 8 | 18 | 100 | 4,868 | 103 | 5,914 | 10 | 279 |

¹ Includes outbreaks among military personnel.

break, and the same organism was isolated from a woman in the isolation unit. However, there was no contact between the nursery and the isolation unit except through medical officers and nursing supervisors. The source of this outbreak was not found. The source of the other outbreak was a mother whose stool yielded the same organism as that found in the infants.

Organisms isolated from specimens collected during the investigation of the *Salmonella* outbreaks were *anatum*, *blockley*, *chester*, *enteritidis*, *heidelberg*, *infantitidis*, *montevideo*, *neunschen*, *newport*, *oranienburg*, *rabislaw*, *thompson*, and *typhimurium*.

Shigellosis

Of the 8 outbreaks of shigellosis reported, 1 was waterborne, 2 were transmitted by person-to-person contact, and 3 were traced to carriers handling food. In two, the source and mode of infection was not determined.

One of the outbreaks spread by personal contact was in a farm labor camp. Here, poor environmental conditions and lack of adequate water supply were contributing factors. The other was in an elementary school where there was evidence of poor personal hygiene which might allow rapid transmission of the disease by the fecal-oral route. Examination of the restroom facilities at this school revealed that water pressure was low and insufficient to flush toilets during periods of increased water usage and to permit adequate handwashing.

The largest outbreak of shigellosis reported in 1956, involving 800 cases, resulted from contamination of a public water supply by a mountain stream polluted with fecal waste. Three of the outbreaks resulted from the *sonnei* type of organism, and three from the *flexneri* type. *Shigella alcalescens* was isolated from specimens collected during one of the outbreaks, and in another, no specific organism was found.

Staphylococcal Food Poisoning

In 1956, there were 111 outbreaks of staphylococcal food poisoning with 4,313 cases reported as compared with 102 outbreaks with

Table 1. Foodborne and waterborne disease outbreaks reported in 1956 by vehicle of infection

| Area | Water | | Milk and milk products ¹ | | Other foods ¹ | |
|---------------------------|-----------|-------|-------------------------------------|-------|--------------------------|--------|
| | Outbreaks | Cases | Outbreaks | Cases | Outbreaks | Cases |
| United States.. | 9 | 1,719 | 31 | 873 | 210 | 11,133 |
| New England: | | | | | | |
| Maine..... | | | | | 11 | 227 |
| Vermont..... | | | | | 2 | 98 |
| Massachusetts..... | | | | | 8 | 129 |
| Rhode Island..... | | | | | 1 | 24 |
| Connecticut..... | | | | | 4 | 162 |
| Middle Atlantic: | | | | | | |
| New York..... | 1 | 6 | 1 | 68 | 9 | 593 |
| New Jersey..... | | | | | 4 | 167 |
| Pennsylvania..... | | | | | 2 | 38 |
| East North Central: | | | | | | |
| Ohio..... | 1 | 700 | | | 7 | 38 |
| Indiana..... | | | | | 5 | 324 |
| Illinois..... | | | 1 | 9 | 10 | 523 |
| Michigan..... | | | | | 3 | 269 |
| Wisconsin..... | | | | | 1 | 11 |
| West North Central: | | | | | | |
| Minnesota..... | | | | | 3 | 102 |
| Iowa..... | | | | | 1 | 12 |
| Missouri..... | | | 1 | 13 | 4 | 238 |
| North Dakota..... | | | | | 2 | 72 |
| Kansas..... | | | | | | |
| South Atlantic: | | | | | | |
| Maryland..... | 1 | 10 | | | 1 | 152 |
| District of Columbia..... | | | | | 2 | 39 |
| Virginia..... | | | | | 5 | 236 |
| North Carolina..... | | | | | 3 | 212 |
| Georgia..... | | | | | 3 | 353 |
| Florida..... | | | | | 7 | 182 |
| East South Central: | | | | | | |
| Kentucky..... | | | | | 6 | 898 |
| Alabama..... | | | | | 1 | 60 |
| West South Central: | | | | | | |
| Arkansas..... | | | | | 2 | 390 |
| Louisiana..... | 1 | 72 | | | 5 | 622 |
| Texas..... | | | | | 1 | 100 |
| Mountain: | | | | | | |
| Montana..... | | | | | 1 | 700 |
| Idaho..... | 1 | 15 | | | 4 | 20 |
| New Mexico..... | | | | | 1 | 323 |
| Utah..... | 1 | 800 | | | | |
| Nevada..... | | | | | 1 | 25 |
| Pacific: | | | | | | |
| Washington..... | | | 1 | 4 | 5 | 299 |
| Oregon..... | | | | | 6 | 52 |
| California..... | 3 | 116 | 1 | 80 | 73 | 3,331 |
| Alaska..... | | | | | 2 | 3 |
| Hawaii..... | | | | | 4 | 71 |
| Puerto Rico..... | | | 21 | 579 | | |
| Virgin Islands..... | | | 5 | 120 | | |
| United States 1955.. | 2 | 22 | 3 | 302 | 193 | 9,633 |
| United States 1954.. | 7 | 452 | 9 | 200 | 234 | 11,701 |

¹ Includes outbreaks among military personnel.

family gathering where only 2 persons developed the disease among the 14 present.

Botulism

Eleven outbreaks with 22 cases (9 deaths) of botulism were reported by 4 States and Alaska. In only one outbreak was the botulism organism isolated, this being type A. There was sufficient evidence, including clinical manifestations, to warrant a diagnosis of botulism in the other outbreaks. Most of the outbreaks involved only one case. However, in 1 outbreak, there were 6 cases (1 death) in a private family. These individuals had eaten home-canned beet greens. Four persons in another family became ill after eating string beans. In Alaska, there were 2 outbreaks, 1 from seal meat and 1 from whale meat, presumably type E infections. Although the organism was not recovered, a heat-labile toxin was found. Also, the investigator has recovered the same type of botulism organism previously in these kinds of meat. Other foods involved in the outbreaks were all home-canned products, including pickled pigs' feet, potatoes, and olives.

Toxic Agents

Two disease outbreaks were from arsenic poisoning, one from spray being blown from a peach orchard to a cabbage field. Sixty people who ate cabbage from this field became ill. The other episode of arsenic poisoning was in a rural family who drank water from a well which was deliberately contaminated with rat poison. Two outbreaks were attributed to food coloring—1 was caused by nitrite from the coloring used in weiners and 1 by copper found in a cake coloring. Three children became ill after playing with an insect spray. Soft drinks were the vehicles of infection from the remainder of the outbreaks. One outbreak resulted from the accidental contamination by insect spray of paper cups used for dispensing the soft drink. In another outbreak, cadmium from a container contaminated an acid drink. The other outbreak was copper poisoning which developed when a defective valve in a dispensing machine permitted carbonated water to back up and remain in contact with cop-

per pipes. The ninth outbreak was due to antimony in an acid drink which had been left too long in a defective coffee pot.

Streptococcal Infections

Only 4 outbreaks of streptococcal food poisoning were reported; 2 were in school, 1 in personnel of the Armed Forces, and 1 in a private household. Three were associated with salads, two of them with egg salads. Although no organisms were isolated from the food, there was good evidence that food handlers had contaminated it. In 1955, egg salad was responsible for one large outbreak of streptococcal food infection reported during that year. A streptococcal organism was isolated from both the salad and the person who prepared it. One outbreak of two cases, in 1956, was from canned spaghetti and meat balls. It probably was contaminated in the home because unopened cans appeared to be normal.

Streptococcal infections not associated with food were reported from three schools and an Armed Forces training center. A total of 776 cases were reported in these 4 outbreaks.

Miscellaneous Outbreaks

During 1956, various outbreaks of illness not associated with food were reported. Some of the more important are summarized briefly in the following paragraphs.

Only two outbreaks of diarrhea of the newborn were reported in 1956. In one, *Escherichia coli* was found; in the other, alpha *coli* was reported as the etiological agent. Twenty-two infants were involved in these outbreaks. Another type of disease in newborn infants which apparently is increasing in frequency is characterized by staphylococcal skin infection. Six epidemics were reported among infants in hospital nurseries, and in some instances, the same serotype of organism was found in breast abscesses of some of the mothers who nursed these infants.

Another type of skin infection (erythema infectiosum) was reported among school children in four States and Hawaii. This infection was also found in some adults.

Several outbreaks of diphtheria were re-

4,130 cases in 1955. This represents a small increase in both number of outbreaks and number of cases over those for the previous year. During the past 3 years, the number of cases per year has exceeded 4,000. The 26 outbreaks with about 700 cases in Puerto Rico and the Virgin Islands might be considered as one single episode since all resulted from the same product, milk reconstituted from dry milk used in school lunch programs. Although only 36 outbreaks (33 *Staphylococcus aureus* and 3 *Staphylococcus albus*) were laboratory confirmed, there was enough epidemiological evidence to substantiate classification of the remaining outbreaks as staphylococcal food poisoning. In 1955, there were 15 laboratory-confirmed outbreaks and in 1954 the number was 26.

In about half of the outbreaks of staphylococcal food poisoning reported this year, lack of refrigeration or a food handler was given as the source of infection. A typical example of infection by a food handler is the outbreak reported in a high school, where 103 persons became ill following a turkey dinner. An investigation revealed that 1 of the 3 persons who deboned the turkeys had an infected burn on one finger. It was postulated that this individual infected about a third of the meat. The fact that about a third of those who ate turkey became ill from 2 to 6 hours later would seem to make this explanation a reasonable one.

Among the places most often mentioned in connection with these outbreaks of staphylococcal food poisoning were private residences and public eating places, with 18 outbreaks attributed to each. There were 15 outbreaks in schools and colleges, and in 12 outbreaks products from bakeries were considered to be vehicles of infection.

Gastroenteritis

Of the 88 outbreaks of gastroenteritis shown in table 2, 69 resulted from food other than milk and milk products. In these foodborne outbreaks, 5,100 persons were affected. In many instances, no food was available for laboratory tests, and in others, no pathogenic or-

ganisms could be isolated from the suspected food or from stool specimens from the patients. This is similar to the experience in previous years. Bacteriological tests on specimens from 4 outbreaks revealed paracolon organisms, and specimens from 3 yielded streptococci. In one outbreak, an unidentified gram-positive coccus was found.

Six outbreaks of gastroenteritis, with 903 cases, were waterborne, and 2 outbreaks, with 93 cases, were milkborne. In five outbreaks there was evidence of person-to-person spread, suggesting viral infections, but virus isolations were not made. An outbreak in Colorado was first thought to have been waterborne because routine examinations showed the water supply to be substandard, but investigation revealed that the cases were not related to water consumption. The outbreak was regarded as gastroenteritis of viral origin, a type of infection common in the area in certain seasons.

During the year, reports were received of 12 outbreaks of gastroenteritis (2,112 cases) in which turkeys were incriminated. Of these, 9 outbreaks were in schools, 2 in institutions, and 1 followed a church dinner. No etiologic agent was found in any of these outbreaks. Some may have been due to salmonella infections, and others possibly were due to *Clostridium welchii*.

Trichinosis

Eleven outbreaks of trichinosis with 98 cases were reported in 1956. About the same number of cases were reported as for 1955, but the number of outbreaks more than doubled. In 1955, one outbreak with 69 cases was reported among members of two fraternities. In 1954, there was no large outbreak, but in 1953 one outbreak with 73 cases in an institution was reported. The largest outbreak in 1956, with 29 cases, resulted from sausage eaten in 3 counties of Pennsylvania. The source was a local butcher who supplied the pork product. In another outbreak, 12 cases developed in persons who ate a German delicacy supplied by a local butcher. One outbreak followed a cocktail party, and one was in a boys' camp. The remainder were in private families, including a

Tomorrow's Challenges To the Medical Sciences

AN audience of about 100, composed predominantly of officials of major American corporations, heard the Honorable James B. Conant, retiring Ambassador to West Germany, introduce and summarize three panel discussions on the prospective need for medical research and teaching at a conference on *Tomorrow's Challenges to the Medical Sciences*, held at the University of Chicago, March 5, 1957. The meeting was sponsored by the National Fund for Medical Education in cooperation with the International Harvester Foundation and the United States Steel Foundation.

Dr. Conant, former president of Harvard, distinguished chemist, and author of *On Understanding Science*, flatly supported the case for corporate contributions to medical schools, saying, "This money will go to protect the health of your employees and customers. Your stockholders will get their money back." This comment was offered in response to the question raised by one corporation official who said he doubted that he could justify use of stockholders' funds to endow teaching hospitals or medical schools.

A sum between \$500 million and \$1 billion over the next 20 years was estimated by Dr. Vernon W. Lippard of Yale University School of Medicine as needed to meet increased operating and maintenance costs in private or independent medical schools. He said 25 new medical schools will be needed by 1975 (7 are in prospect, 4 of them expansions of 2-year schools) and that the number of graduates per year should be 200 more than at present. However great the cost, he observed, Americans spend more money each year on tombstones than on medical education.

Apart from these quantitative changes, indicated by the increase in population, growing industrialization, and urbanization, with the concurrent increase in demand for health services, the panels discussed impending changes in the character of medical knowledge and applications.

Dr. Stafford L. Warren, University of California School of Medicine, Dr. Austin M. Brues, University of Chicago College of Medicine, and Dr. A. Baird Hastings, Harvard Medical School, commented on the implications to medicine of nuclear physics: the new knowledge of biochemistry revealed by radionuclides used to trace chemical processes; the need to evaluate genetic and somatic hazards of radiation exposure and to develop protective measures; the probable environmental effects of nuclear power plants; the application of electron micrography to analysis of macromolecules and viruses; and the employment of radiations in diagnosis and therapy.

Dr. Brues expressed confidence that evaluation of the hazards of radiation, both internal and external, would progress rapidly enough to permit effective protective measures to be applied.

Recent changes in knowledge were said to require wholesale revision of textbooks and study courses. And the increasing range of scientific information of concern to the physician, it was suggested facetiously, might add up to a 16-year study course. But the panel was confident that selectivity, both with respect to learning and the learners, would permit physicians to begin practice long before they are old enough for retirement.

Many changes in physiological concepts were attributed to studies with radionuclides, which Hastings likened to birdbanding. For example, radionuclide studies showed that cells exchange salts, contrary to the indications of chemical studies. The rate of such exchange is a phase of metabolism. Hastings also mentioned a 3-year study which succeeded in changing "or" to "and." Demonstrating that diabetes consists of overproduction and (not or) underconsumption of sugar, the study resolved a longstanding controversy.

Hastings concluded that biological education for medical students today is less than what any educated man should receive in order to live intelligently in today's world. He felt a balanced education would give 60 percent of the time to humanities and social studies and 40 percent to the medical sciences.

Another radionuclide discovery, that animals

ported, one of the largest being in Illinois. Here, 60 cases developed among migratory workers from Texas. Later in the year, during October, an outbreak occurred in a relatively low income group in which primary immunizations had not been given to most of the inhabitants. A total of 165 cases, with at least 2 deaths, were reported in Detroit in 1956. Smaller outbreaks occurred in Indiana and New Mexico. Other outbreaks reported in 1956 involved fewer than 10 cases.

Eight outbreaks of infectious hepatitis were reported in 1956. One outbreak with an undetermined number of cases was similar to one reported in 1955, that is, both were among members of a football squad who had been drinking contaminated water. Another 1956 outbreak of 276 cases was also considered to be waterborne and *E. coli* was isolated from water samples. Although water was associated with these outbreaks, there was no evidence which would definitely incriminate it. None of the outbreaks in 1956 were foodborne. In about half of the outbreaks there was evidence of person-to-person transmission, and for the other half, the source was not determined.

Localized outbreaks of arthropod-borne types of infectious encephalitis occurred in several parts of the United States in 1956. In Massachusetts, a group of 11 confirmed and 3 presumptive cases of the eastern equine type of infection was reported, and in Maryland, there were 3 human cases, 2 presumptive and 1 confirmed. This disease in horses and in pheasants was observed in these and several other States. Fourteen scattered human cases

of western equine encephalitis in California and 16 in northwestern Texas were confirmed by serologic tests. A large urban epidemic, 110 cases with 13 deaths, of the St. Louis type of encephalitis was reported in Louisville, and another, consisting of 17 cases, in southwestern Kentucky. A sizable outbreak occurred in northwestern Texas, smaller ones in two areas of Colorado, and one in Kansas.

During the year, more than 500 cases of psittacosis in humans were reported. Most of these were single cases and resulted from contact with pet parakeets. However, outbreaks were reported in five States. Early in the year, the disease occurred in Oregon among a large number of persons who worked on turkey farms, in rendering plants which handled dead turkeys, and in employees of poultry processing plants. Two other small groups of cases were reported in which there was contact with infected birds. Ducks on a farm in Virginia were found to be infected with psittacosis, and at least four persons working on the farm became ill with the disease. In Minnesota, seven persons who became ill with psittacosis had contact with Easter chicks. No virus was found in any of the chicks.

Only one outbreak of brucellosis was reported, this being milkborne. It involved four children who drank raw milk. There were several single cases of the disease from raw milk. Others were from handling cow or hog carcasses in processing plants. In Maine, Newcastle disease was reported among poultry flocks, and one human case is known to have occurred.

PERFORMANCE

ON A CANCER KNOWLEDGE TEST

Medical and Osteopathic STUDENTS

DAVID A. WOOD, M.D., PETER G. LORET, Ph.D., and LEONARD W. TOWNER, Ph.D.

ANNUALLY since 1949, the majority of the medical students in the United States have taken the Examination for Students of Medicine in the Subject Matter of Cancer, developed and administered by the education project

Dr. Wood is professor of pathology and director of the Cancer Research Institute, University of California School of Medicine. President of the American College of Pathologists from 1952 through 1955, he is now president of the American Cancer Society. Dr. Loret is assistant research oncologist (medical education) with the Cancer Research Institute, and Dr. Towner, now assistant professor of psychology, Long Beach State College, Long Beach, Calif., was formerly with the institute.

The education project of the Cancer Research Institute, which conducted the study reported here, is supported by a grant from the National Cancer Institute, Public Health Service.

of the Cancer Research Institute at the University of California School of Medicine. In 1952, two osteopathic colleges entered the testing program, and since 1953, all the osteopathic colleges in the Nation have participated. The same test has been administered to both medical and osteopathic students each year, although the test itself has undergone annual revisions.

The examination attempts to evaluate students' knowledge of cancer. It consists of 150 multiple-choice items in which the subject is asked to select the best of 5 alternative responses. The major aspects of the examination have been discussed in previous publications (1-5). Briefly, it covers a representative sampling of all types and locations of tumors and deals with three major aspects of these neoplasms: diagnosis, characteristics, and treatment.

consume carbon dioxide, forced revision of the precept that life is like a burning candle: It is not.

The importance of selecting and motivating medical students effectively, in light of increasing responsibilities of the physician, anticipated the discussion of the behavioral sciences by a panel including Dr. Donald G. Marquis, University of Michigan, Dr. John Romano, University of Rochester School of Medicine, John M. Stalnaker, president of the National Merit Scholarship Foundation, and Theodore O. Yntema, vice president in charge of finance, Ford Motor Co.

Marquis noted that the behavioral sciences concern all professions in that they attempt to apply scientific method to the social studies. Much of his discussion was devoted to describing the scope and potentialities of the behavioral sciences.

Stalnaker indicated how behavioral sciences may be applied specifically to the difficult and complex task of selecting candidates for medical education with particular concern for that half of the top quarter of high school graduates who do not go on to college.

Romano's remarks dealt with the challenge of mental health, as an aspect of the behavioral sciences, and he discussed modern psychiatric methods with respect to their similarities to and differences from other scientific studies. Despite the handicap of psychiatric studies, that subjects are not as amenable to control or manipulation as the material of the physics laboratory, the body of common experience and observation was found to be testing and refin-

ing psychiatric theory. Major objects of interest to the psychiatrist continue to be the study of brain-mind phenomena, brain-mind-body relationships, and the field of interpersonal relationships. In particular, Romano commented on the significance of separation from and loss of key human figures in one's life as determinants of mental and physical disabilities.

To accommodate the need for extending medical learning in radiology, behavioral sciences, and other new developments, Yntema recommended extending the process of selection and preparation for advanced education into the early years of childhood. He felt far better use could be made of time spent in elementary and secondary schools, not to mention medical schools. Since scientific progress often means simplification of concepts, he suggested that many advances may in fact short-cut traditional courses of instruction. Educational processes, he indicated, might be rationalized as successfully as automobile production processes.

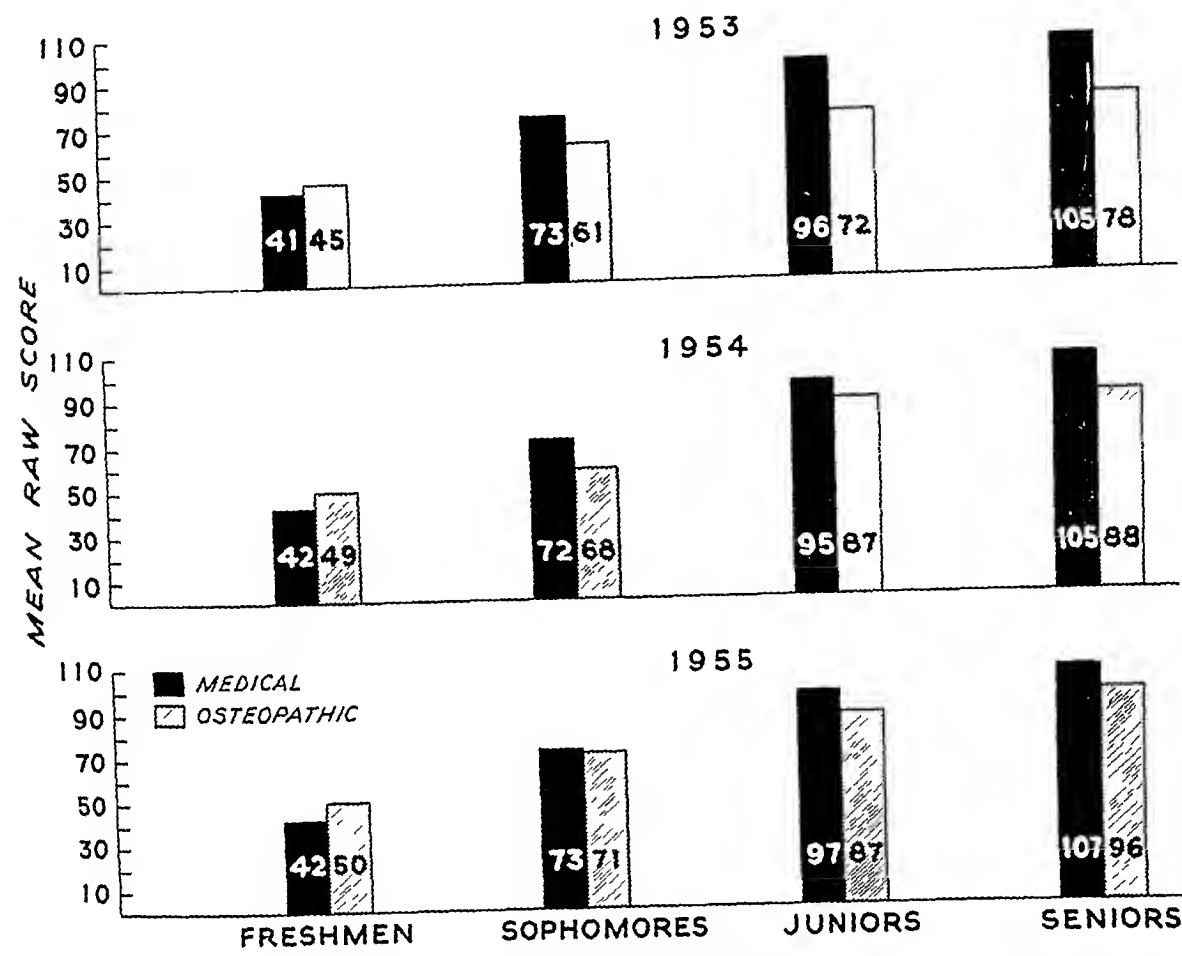
Following other comments, questions, and discussions, Dr. Conant stressed the opportunity industry has of extending scientific knowledge for the benefit of civilization, the administrative skills which industry may contribute to scientific investigation, and the opportunity for using industrial plants as a channel for popular health education and for improvement of medical care and public health practice. For leadership of such developments, however, he said, look to the faculties and graduates of medical schools.

Grants for Advanced Nurse Training

The Public Health Service has granted 587 awards for advanced nurse training in teaching, supervision, and administration; 553 of the awards are for full-year courses and 34 for spring or summer sessions. The Service has completed allocation of \$2 million appropriated by Congress August 1956 for the first year of the 3-year program.

Half of this year's trainees in 56 schools of nursing and public health are preparing for teaching positions. Of the other half, 28 percent are training for administrative posts and the remaining 22 percent, for supervisory positions.

Figure 1. Mean raw scores for medical and osteopathic students on the cancer knowledge examination, 1953-1955.



to those of the raw scores. In each of the last three cases, the mean of the medical school means falls above that of the osteopathic school means.

Scores in Specific Areas

The average percentage of correct responses obtained in 1955 by the medical and osteopathic students on items dealing with the diagnosis, characteristics, and treatment of tumors is shown in figure 2. The osteopathic freshmen consistently scored higher than the medical freshmen in each of the three areas, while, with one minor exception (the sophomores in the area of treatment), the osteopathic sophomores, juniors, and seniors scored slightly below the corresponding medical students. Available longitudinal data show increases in percentage

between 1953 and 1955 for all of the areas at all four class levels for both types of schools, although these increases have been somewhat more marked in the osteopathic schools. One might expect to find particularly great differences in the area of treatment, but figure 2 shows that this is not the case. Apparently, the patterns of cancer knowledge of medical and osteopathic students are quite similar.

Comparisons of Initial Gains

The increases in mean raw score since the initial year of participation are of particular interest as measures of the development of the cancer teaching programs in the two types of schools under consideration.

Since 1949, the initial year of participation by medical schools, there has been a steady increase

In this paper, we shall consider the relative performance of medical and osteopathic students on this test. All valid tests available from the medical and osteopathic schools for 1953, 1954, and 1955 were studied to determine (a) distributions of individual scores, (b) distributions of school means, and (c) mean percentages of correct responses in the areas of diagnosis, characteristics, and treatment of neoplasms. In addition, test results for the medical students for 1949-55 and for the osteopathic students for 1953-55 were analyzed for an estimate of the increases in mean raw score since the first year of participation in the testing program.

The number of students whose tests were included each year from 1953 through 1955, the major period of the study, are given in the accompanying table.

Individual Scores and School Means

The distribution of the individual raw scores for each medical class and for each osteopathic class each year of the study (freshmen, sophomores, juniors, and seniors, 1953-55) was plotted in frequency polygon form. These distributions are all similar in configuration. In each of the 3 years, the mean score for osteopathic freshmen exceeded the mean score for medical freshmen.

When the means of these distributions are plotted in histogram form, as shown in figure 1, several additional trends are revealed. The data indicate not only that the mean score for the osteopathic freshmen was above the mean score for medical freshmen every year, but also that the magnitude of this difference has increased with each succeeding year. This may be attributable partly to the fact that the osteopathic schools devote considerably more time to

cancer teaching in the freshman year than is customarily the practice in medical schools.

Another notable trend shown in the data in figure 1 is that the differences between the osteopathic and the medical mean scores for the sophomores, juniors, and seniors have gradually decreased since 1953.

Statistical determination of the significance of differences in mean scores between the 4 medical and the 4 osteopathic classes for each of the 3 years was accomplished by means of the critical ratio. In 11 of the 12 comparisons the difference between the mean score of the medical students and the mean score of the osteopathic students was significant well beyond the 1 percent level of confidence. This level of confidence implies that there is less than 1 possibility in 100 that the observed difference is due to chance. In the 12th comparison, that of the 1955 sophomore classes, the difference was significant at the 5 percent level of confidence.

Statistical significance, of course, does not necessarily imply a meaningful difference when the number of individuals involved is very large, as is the case here. It is a matter of judgment as to how many points' difference constitutes educational significance in terms of the students' actual knowledge of the subject matter of cancer. Nevertheless, the educational effort required to overcome this difference with such a large number of students could itself be considered significant.

The distributions of school means for each class each year show trends similar to those of the individual raw scores. The mean scores of the osteopathic schools at the freshman level tend to fall above the mean scores of the medical schools, and the distributions of school means for the upper three classes are similar in shape

Number of medical and osteopathic students taking the cancer knowledge examination, by year

| Year | Medical students | | | | Osteopathic students | | | |
|------|------------------|------------|---------|---------|----------------------|------------|---------|---------|
| | Freshmen | Sophomores | Juniors | Seniors | Freshmen | Sophomores | Juniors | Seniors |
| 1953 | 4,713 | 4,808 | 4,387 | 3,727 | 492 | 458 | 447 | 380 |
| 1954 | 4,174 | 4,191 | 3,957 | 3,166 | 363 | 380 | 361 | 294 |
| 1955 | 4,324 | 4,295 | 3,904 | 3,369 | 361 | 345 | 364 | 324 |

Summary

From a study of the relative performance of medical and osteopathic students on a test of cancer knowledge, the following major findings are evident:

1. The mean raw score for freshmen students of osteopathic schools exceeded that of freshmen of medical schools for all 3 years, 1953, 1954, and 1955.

2. The mean raw scores of sophomore, junior, and senior students in medical schools exceeded those of the osteopathic students for all 3 years. The magnitude of the difference between the respective classes for the two types of schools, however, has decreased from year to year.

3. In each of the three areas—diagnosis, characteristics, and treatment—the osteopathic freshmen students consistently obtained higher scores than the medical freshmen. At the sophomore, junior, and senior levels, however, the mean percent correct for the medical students exceeded that for the osteopathic students, with one minor exception.

4. All classes in both types of schools have shown increases in the mean score for the areas of diagnosis, characteristics, and treatment of cancer. These increases have been somewhat more marked in the osteopathic schools.

5. Since their initial participation in the cancer testing program, both types of students have shown improvement in cancer learning. The degree of improvement has been somewhat more rapid for the osteopathic students, although their performance during the sophomore, junior, and senior years is still below the performance level of medical students.

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Mental Health Services in Colorado Schools

A 3-day workshop was held recently in Denver on mental health services in Colorado schools. A joint project of the Colorado State Department of Public Health and the State Department of Education, the workshop was supported by a grant from the National Institute of Mental Health, Public Health Service.

Represented at the conference were workers in clinical psychology, psychiatry, social work, school psychology, school administration, public health, and school and public health nursing. Participants came primarily from outlying districts of the State, where there are few mental health services in schools.

The conference defined the roles of professional mental health workers so that their services may be better used by educators to meet everyday school problems. Ideas were developed on the planning of mental health services at the local level, already reflected in concrete planning by some Colorado communities.

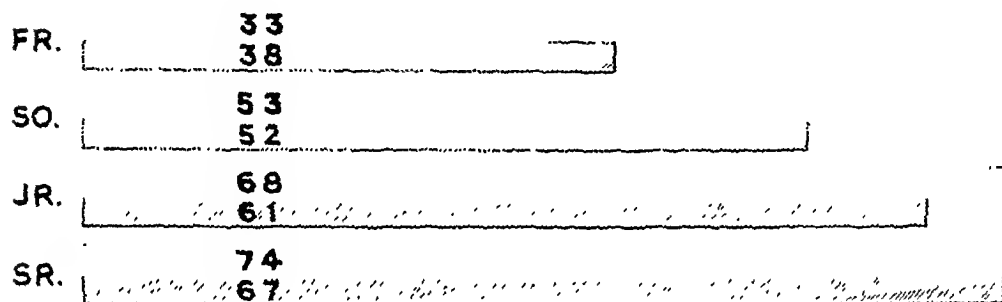
in the mean scores of the sophomores, juniors, and seniors, while the mean freshmen scores have tended to remain at a constant level. This latter phenomenon is to be expected since there is little reason to believe that freshmen in the medical schools in 1955 knew any more about cancer than did the freshmen in 1949. However, corollary data collected by the education project suggest that there has been a steady improvement in the content and method of cancer

instruction for the upper classes in medical schools.

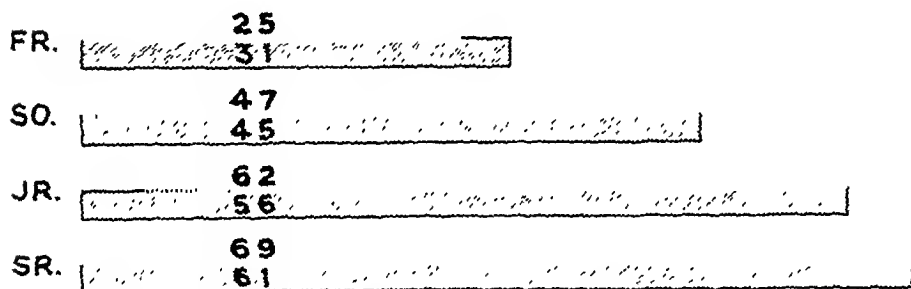
The teaching of cancer in the osteopathic schools shows similar trends. Since 1953, the osteopathic students' initial year of participation, these students have shown a relatively greater degree of gain than did the medical students during their first 3 years of participation. Both types of schools, however, show evidence of improvement in cancer learning.

Figure 2. Mean percent correct scores for medical and osteopathic students in the areas of diagnosis, characteristics, and treatment on the cancer knowledge examination, 1955.

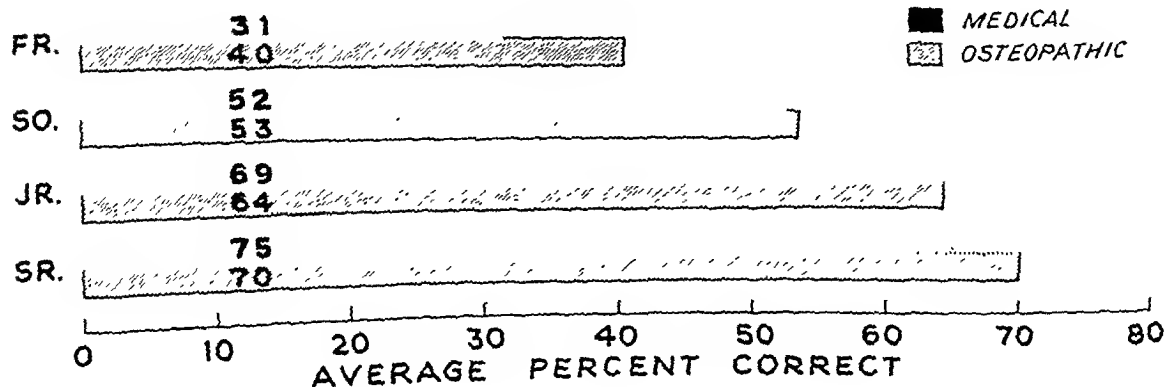
DIAGNOSIS



CHARACTERISTICS



TREATMENT



position, enters a 6-month probationary period. He receives full salary and living expenses during indoctrination and away-from-home assignments. The trainee's services are subject to immediate termination either voluntarily or by his employer.

On his first day of employment, the recruit is sent to 1 of 4 indoctrination centers located in county health departments, staffed with local workers and jointly operated by the State and county health departments. The four departments were selected to serve as official indoctrination centers because they are staffed by trained personnel engaged in broad, working sanitation programs. One sanitarian in each official center is appointed trainer, and his salary is increased for this service.

During indoctrination the recruit is observed closely as he follows a supervised course designed to fit his individual abilities. In this course he is introduced to the overall public health field. Public health philosophy, principles, programs, practices, and organization and administration are gradually unfolded for him. He observes community organizations, and government and nonofficial agencies and their impact on public health practices. Besides learning the value of teamwork in public health, he can develop his skills and techniques through supervised observation and practice in some sanitarian activities.

At the same time, the trainer studies and evaluates his progress and potential, keeping careful records and making periodic reports. The recruit may stay at the center from 4 to 6 weeks, depending on his progress, after which he enters the next phase of training in the field. Many recruits do not measure up to expectations during indoctrination and are therefore eliminated at this point; 20 percent of recruits in 1956 proved unsuited for further study in the program.

Supervision While on the Job

The new employee is next assigned to a job in the field where he is closely guided by his health director and supervisors until he demonstrates his ability to work with minimum help. This is his proving period in which he must show enough growth, potential, and per-

formance to warrant ending the probationary period of employment. At this stage his tenure is usually from 4 to 12 months.

Twelve Weeks' Sanitation Course

Finally, the trainee is given a course in basic sanitation offered in a centrally located field training station in one of the local health departments. This course, limited to 16 students in a session, is planned for the inexperienced sanitarian with 4 to 12 months of field practice in sanitation. The trainee lives with others in his group in a nearby hotel throughout the 12 weeks. This stage of training may prove the most profitable because he continues his study of sanitation in off-duty hours through group discussions with other trainees and through project assignments.

One director and an assistant staff the field training station, for which teaching personnel are drawn from State and local health departments, private industry, and nearby colleges.

Basic fundamentals in the component parts of sanitation are taught along with functional program operation. Methods of teaching follow a pattern of classroom lectures, conferences, planned field observation, then practice under supervision. Trainees are graded on performance and accomplishment. To measure trainee growth and to improve instruction, the testing criteria of the American Public Health Association are used in addition to other materials. Those who graduate from the 12 weeks' course become full-fledged sanitarians, capable of handling their assignments with a minimum of direction. Thus far 124 candidates have successfully completed the course. But training opportunities have not stopped.

Refresher and Advanced Training

To maintain organization esprit and keep the experienced sanitarian stimulated and abreast of developments in sanitation, short refresher courses are held in selected components of the subject every year. Lasting from 2 to 10 days, the courses are offered at locations within commuting distance and are limited to 30 participants for each class. Usually the teaching

Training New Sanitarians in Virginia

CONLEY W. WESTON, B.S.

EVERY community in Virginia today is served by an organized health department. Ten years ago such services were available to only one-half the State. Concomitant with this rapid growth in local health units has been the demand for broader services to match a higher standard of living and changes in the social structure.

The expansion of both health units and programs imposed upon the public health administrative force of the State the problem of recruiting personnel to fill the new positions and to provide the varied services anticipated by the public.

Especially difficult was the recruitment of enough sanitarians to staff the new jobs. Furthermore, turnover in this field often exceeded replacements, and many positions remained vacant for extended periods. The inadequacy of the staff and recruiting program of the Virginia Department of Health in coping with the situation prompted the search for a solution.

Early in 1952 the Virginia Department of Health launched a study of its recruiting and training needs. Training programs and salary scales for sanitarians in other States were reviewed, and the resources of industry, universities, and the Public Health Service were used. The State then designed a recruiting and training program that was geared to its own requirements.

Two major characteristics of the program are, first, flexibility to facilitate modifications

and, second, tying in training with recruiting. Fused with this process is the understanding of the need for frequent salary changes.

The administrative responsibility for the inservice training program is assigned to the Virginia Department of Health. A section of sanitation training was established in the division of local health services to plan, coordinate, and evaluate the training. Program costs are borne by the State health department, with county health departments paying a percentage of trainee salaries. Recruiting is centralized at the personnel bureau of the State health department.

The basic structure of the program involves the following major stages:

- Recruiting and indoctrinating new sanitarians.
- Supervising new sanitarians while on the job.
- Giving new sanitarians 12 weeks of basic fundamentals in sanitation.
- Conducting topical short refresher courses for experienced sanitarians.
- Offering academic study leading to the master of public health degree for qualified, experienced sanitarians.

Recruiting and Indoctrination

A job description, offering an attractive salary range, limits recruits to college graduates preferably with a major in the physical or biological sciences. Throughout indoctrination, recruits are screened by tests, interviews, and followup of references in order to weed out those unsuited. The personnel bureau carefully explains the entire inservice program to the applicant, who, on his acceptance of the

Mr. Weston is director of the sanitarian training section of the Virginia Department of Health. The paper was read in essentially the same form at the Conference of State Directors of Public Health Training in Atlantic City on November 11, 1956.

Rheumatic Fever Prevention in Utah

L. GEORGE VEASY, M.D.

THE RHEUMATIC FEVER prevention program of the Utah State Department of Health is an outgrowth of a pilot program initiated by the Children's Bureau in an attempt to reduce the State's excessively high death rate from this disease. For the 3-year period 1939-41 the crude death rate from rheumatic fever in Utah was 22.4 per 100,000, higher than the rate for any other State and approximately double the national average (1).

The pilot program, begun in 1940 and continued through 1952, provided diagnostic and treatment services in clinics, hospital and convalescent care, public health nursing, services of a medical social worker, and nutrition consultation in Davis and Weber Counties only. In 1943 the program was extended to Box Elder, and later to Morgan, Summit, and Rich Counties. In 1952 the Utah State Department of Health assumed complete responsibility for the program and extended it to the entire State under its present direction. Unlike the pilot program, the present program does not offer complete care except in cases of total indigency. Principal emphasis of the program has been

placed upon prophylaxis to conform to the overwhelming evidence that both the initial and recurrent attacks of rheumatic fever are precipitated by group A streptococcus infections.

During 1953-55, the first full 3 years of operation of the present program, 1,334 patients were seen. These patients were seen in itinerant clinics held in 10 centers of population scattered throughout the State. Each patient was referred to the program by his family physician, who requested one of the following referral categories for his patient:

1. Diagnostic consultation only.
2. Diagnostic consultation and followup to urge patient to continue prophylactic care in physician's office.
3. Diagnostic consultation with followup and prophylaxis in the Children's Heart Center.
4. Complete care (medical indigency only).

As of 1956, categories Nos. 3 and 4 were combined.

During the period 1953-55 more than 300 new patients were referred to the program each year (table 1). Approximately 50 percent of the 661 patients referred in 1953 were carried over from the program already in existence in the northern counties of the State.

In designing the program it had been hoped that most referring physicians would request that patients be placed in category 2. In so doing, it was felt that the public health nurse could assist the family physician in maintaining a closer followup of his patient while still under his management. However, the percentage of patients referred in this category has been disappointingly small, only about 25 percent.

A total of 209 patients in categories 3 and 4 have been followed for at least 6 months. The remaining 417 patients in these two categories

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Dr. Joseph P. Kesler, acting director of the Utah State Department of Health, furnished guidance in establishing the present rheumatic fever program; Bessie Hansen assisted in the nursing program; and Ivy Jean Reid provided technical assistance.

This paper was presented in part at the First Scientific Convention of the Utah Heart Association, Salt Lake City, Utah, April 6, 1956.

staff is drawn from the same sources as for the 12-week basic training course.

Topical refresher, short courses have been held in such sanitation components as water supplies and sewage disposal, insect and rodent control, sanitary milk control, food service, swimming pools, and advanced practices in supervision. More than 100 experienced sanitarians, including supervisory staff, have attended some or all of these refresher courses.

The final stage of training is professional study in a recognized school of public health leading to a master of public health degree. Provisions have been made for a limited number of qualified sanitarians to pursue this study.

Training Accomplishments

We have not as yet discovered or developed sufficiently accurate criteria for evaluating results of the program, but certain available data indicate general trends.

Job turnover in sanitarian personnel has decreased markedly since the program's inception. The department lost 7 percent by resignation

of sanitarians in 1952 against 32.7 percent in 1951. The loss remained constant at about 10 percent during 1953-54. Late in 1955 resignations increased, and job turnover climbed to 13 percent. This was immediately met in 1956 with small salary increases.

The morale of the sanitarians is higher: They appear to be more satisfied and secure in their positions, want the training, and avail themselves of every opportunity to attend courses. It is no longer necessary to encourage or compel their attendance.

Health directors reflect their approval of the program by cooperating fully in its support. At first they preferred utilizing the services of the new employee to sparing him for training. Now however they demand that the sanitarian be trained. Finally, complaints from the public concerning sanitation services have decreased.

Although we hesitate to state that our training program is complete, we are convinced that certain segments of it are essential to meet the needs of our health projects within the State.

Concentration of Carbon Tetrachloride

A standard prescribing the maximum acceptable concentration of carbon tetrachloride in the atmosphere of working places was approved and published by the American Standards Association in June 1957.

The Public Health Service acted as endorsing sponsor for the standard and recommended its approval. Public Health Service participants in the development of the standard were Dr. W. F. von Oettingen of the National Institutes of Health, who served as chairman of the subcommittee engaged in the preliminary work, and Dr. H. E. Stokinger of the Bureau of State Services.

This standard is one of a series prepared by Committee Z37 of the American Standards Association. The committee coordinates information on air contaminants and establishes acceptable allowable concentrations, which are of use in developing methods for controlling such contamination.

Copies of the carbon tetrachloride standard, known as American Standard Maximum Acceptable Concentration of Carbon Tetrachloride, may be obtained for 50 cents from the American Standards Association, Inc., 70 East 45th Street, New York 17, N. Y.

no control group with which to compare the study group.

Over 50 percent of the group had had only a single attack of rheumatic fever (table 2). Approximately a third had had two attacks, and less than 10 percent had had more than two attacks. No individual had had more than four recognized episodes of rheumatic fever. The average time between attacks, regardless of their number, varied from 2 to 2½ years. Generally speaking, the severity of the heart disease was proportionate to the number of attacks. However, 2 of the 4 patients in functional classification III had a history of only one episode of rheumatic fever.

Prophylaxis

The rheumatic fever prevention program has used four types of prophylaxis (table 3). There have been some recurrences of chorea,

Table 2. Number of attacks and average recurrence time among 209 rheumatic fever patients, Utah State Department of Health rheumatic fever program

| Number of attacks | Number of patients | Average recurrence time (years) |
|-------------------|--------------------|---------------------------------|
| 1 | 126 | 2.3 |
| 2 | 69 | 2.1 |
| 3 | 11 | 2.5 |
| 4 | 3 | |

which will be discussed later. However, during the 3-year period of observation no individual who has maintained continuous prophylaxis has had an episode of clear-cut recurrence of acute "exudative" rheumatic fever with elevations of acute-phase reactants and antistreptolysin titers, with two possible exceptions.

The first patient, a 12-year-old boy, developed migratory arthritis of the knees and ankles, with redness and swelling, 2 months after starting on oral Bicillin. His erythrocytic sedimentation rate became elevated but his antistreptolysin O (ASO) titer showed no rise. He did not develop signs of earitis and he is still on Bicillin prophylaxis.

The second patient was a 13-year-old boy who was receiving oral penicillin prophylaxis. A routine electrocardiogram taken while following him for valvular heart disease with mitral and aortic insufficiency showed a right bundle branch block. He had been asymptomatic during the period in which the electrocardiographic abnormality developed. We had no ASO data on this patient.

Fifteen patients had classic murmurs of mitral insufficiency of class II or greater intensity on entering the clinic, which disappeared on followup examinations. Murmurs of aortic insufficiency disappeared in two persons while they were being followed. These patients are included in the group of 120 patients with only a history of rheumatic fever in categories 3 and 4. On followup examination, three individuals were moved from classification II,B to classification I,A. No patient with rheu-

Table 3. Followup of prophylaxis of rheumatic fever patients, Utah State Department of Health rheumatic fever program

| Type of prophylaxis | Daily dosage | Number of patients | Period of prophylaxis ¹ | |
|-------------------------|------------------------------|--------------------|------------------------------------|-----------------------------|
| | | | Total (years) | Average (years per patient) |
| Sulfadiazine | 1.0 gm. | 27 | 54 | 2.0 |
| Penicillin ² | 200,000 units | 74 | 129 | 1.7 |
| Bicillin ³ | 200,000 units | 113 | 130 | 1.1 |
| Bicillin | 1,200,000 ⁴ units | 59 | 103 | 1.8 |
| Total | | 273 | 416 | 1.5 |

¹ Continuous.

² Buffered penicillin G (Penicoral, Wyeth).

³ Benzathine penicillin (Wyeth).

⁴ Per 30 days.

have been divided into two groups, 120 cases of congenital heart disease and 297 cases which were closed because they failed to comply with the modified criteria of Dr. T. Duckett Jones (2). These 297 cases exceed by nearly 50 percent the number with a confirmed diagnosis and stress the great need for more accurate diagnosis of rheumatic fever.

We have adhered rigidly to the modified Jones criteria (2) and, to our knowledge, in only 3 of the more than 1,000 individuals referred to the program have we erred in not making the diagnosis of rheumatic fever. I am certain that this small number does not represent all the cases in which we have erred in diagnosis, but were the figure 10 times greater the criteria would still have been well over 90 percent accurate. To lend further support to the validity of the criteria of Jones, only four individuals with rheumatic heart disease had no history of an additional major manifestation of rheumatic fever.

Of the 209 patients followed for 6 months, 120 (60 percent) had only a history of rheumatic fever, with no residual heart disease. The 89 patients with rheumatic heart disease were categorically placed in the following functional and therapeutic classifications according to the standards of the American Heart Association: I,A, 55 patients; II,B, 30 patients; and III,C, 4 patients. No patients fell into functional

Table 1. Number of patients referred to the rheumatic fever program, Utah State Department of Health, according to referral category, 1953-55

| Year | Category No. | | | | Total |
|------------|--------------|-----|-----|----|-------|
| | 1 | 2 | 3 | 4 | |
| 1953----- | 162 | 151 | 317 | 31 | 661 |
| 1954----- | 114 | 80 | 111 | 25 | 330 |
| 1955----- | 123 | 78 | 123 | 19 | 343 |
| Total----- | 399 | 309 | 551 | 75 | 1,334 |

classification IV or therapeutic classification D or E except temporarily, during an attack of acute rheumatic fever. Because classification IV,D was only temporary, these patients were included in a classification appropriate to their recovered status.

If these patients represent an accurate cross section of the young people of Utah, the picture of the prevalence and severity of rheumatic heart disease is a far from dismal one. If the condition of these individuals can be stabilized at this point by the use of prophylaxis, the outlook is even more encouraging.

In evaluating the effectiveness of prophylaxis, we had only the histories of these patients before prophylaxis was started to compare with their condition after prophylaxis, since we had

American Heart Association Classification

Functional Capacity

CLASS I: Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain.

CLASS II: Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain.

CLASS III: Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitation, dyspnea, or anginal pain.

CLASS IV: Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of cardiac insufficiency of the anginal syndrome are present even at rest. If any physical activity is undertaken discomfort is increased.

Therapeutic Classification

CLASS A: Patients with a cardiac disease whose ordinary physical activity need not be restricted.

CLASS B: Patients with cardiac disease whose ordinary physical activity need not be restricted, but who should be advised against severe competitive physical efforts.

CLASS C: Patients with cardiac disease whose ordinary physical activity should be moderately restricted, and whose more strenuous efforts should be discontinued.

CLASS D: Patients with cardiac disease whose ordinary physical activity should be markedly restricted.

CLASS E: Patients with cardiac disease who should be at complete rest, confined to bed or chair.

and the patient that prophylaxis was maintained. The fourth patient was on oral Bicillin and, according to our records and her own statements, she had received continuous prophylaxis. She showed no rise in ASO titer with the appearance of her chorea.

Fourteen patients with acute rheumatic fever received "large dose" hormonal therapy as recommended by Kelley and his group (3). All 14 had clear-cut clinical evidence of valvular heart disease at the onset of the institution of hormone therapy. Nine showed complete regression of heart damage so that there is no detectable residual at the present time. Five showed a persistence without progression of the heart damage. In no individual was there any detected progression of the severity of the already existent heart damage.

Four patients in the group had received penicillin for their preceding streptococcal infections, but had gone on to develop rheumatic fever. The dosages could not be determined, but in no case was penicillin continued for more than 3 days.

The small number of adverse reactions to prophylaxis has been encouraging. Sulfadiazine was discontinued on two patients because of a morbilliform rash, which disappeared upon withdrawal of the drug. Had we been able to follow these two individuals more closely, prophylaxis probably would have been resumed. Oral penicillin was stopped in 3 patients who developed urticaria and in 2 who developed a morbilliform rash. All five reactions reappeared upon readministration of the drug.

We have observed no reactions to oral Bicillin and have recorded no cases of gastric intolerance to this drug. Three patients developed urticaria while on intramuscular Bicillin. Bicillin was discontinued in 11 other cases because of local intolerance and extreme emotional reaction to injection of the drug. Tolerance to Bicillin injection has varied greatly; some patients have been greatly upset and others have not been bothered at all. Because we have had to discontinue Bicillin in 25 percent of our patients, we do not feel that it is satisfactory for routine clinic use. We are certain, however, that it is effective and that,

if used wisely in individual patients, it could well prove to be one of the more valuable forms of prophylaxis.

Followup

The most disappointing phase of our program has been the handling of patients in category No. 2 (those who had been seen in the clinic for a diagnostic visit and later followed by the family physician and the local public health nurse). We do not know the exact status of these individuals at this time. Reports from the local public health nurses are discouraging. Maintenance of prophylaxis has been poor, and unconfirmed recurrences of rheumatic fever have been reported. What had been hoped would be the most successful phase of our program has thus far proved to be the most inadequate.

According to reports of the local public health nurse, only 62 (50 percent) of the 122 patients in category No. 2 have maintained prophylaxis. The remaining 60 gave the following reasons for discontinuing prophylaxis:

| | |
|----------------------------------|----|
| Advice of family physician..... | 22 |
| No reason given..... | 18 |
| Too expensive..... | 17 |
| Language barrier..... | 1 |
| Urticaria (oral penicillin)..... | 1 |
| Advice of chiropractor..... | 1 |

These figures support the author's opinion that the key to maintaining prophylaxis is the active participation of the family physician. One-third of the patients who discontinued prophylaxis did so on the advice of the family physician. Another third stopped because of a lack of awareness or of regard for the value of prophylaxis. Apathy of patients toward prophylaxis, I feel, can be overcome by the family physician who is sufficiently enthusiastic and convincing.

Assistance from public agencies or modification of the type of prophylaxis could solve the very real problem of expense for many families. Increasing the amount of penicillin should not be recommended until it is conclusively shown that it will result in an appreciable decrease in the recurrence rate of rheumatic fever, since the additional expense would

Table 4. Recurrences of rheumatic fever resulting from break in prophylaxis

| Patient | Reason for break | Change in classification from— | Time between break and recurrence (years) |
|---------|-------------------------|--------------------------------|---|
| E. W. | Sensitive to penicillin | History to I,A | 1.2 |
| B. P. | Physician's advice | do | .2 |
| B. T. | Inadvertence in clinic | History to II,B | .3 |
| R. L. | Moved from State | History to I,A | 1.0 |
| S. N. | Own volition | do | .2 |
| D. L. | do | do | 1.3 |
| L. P. | do | do | .2 |
| E. S. | do | No change | .3 |

matic heart disease who maintained prophylaxis was reclassified in a lower functional classification during the 3-year period of observation.

Siblings of three rheumatic fever patients developed rheumatic fever while the patients were receiving prophylactic treatment. ASO titers were obtained from two patients before and during the time their siblings had rheumatic fever. No rise in titer was demonstrated.

Recurrence of Rheumatic Fever

Eight patients in categories 3 and 4 had recurrences of rheumatic fever (table 4). Each had had a clear-cut break in prophylaxis. Four patients discontinued prophylaxis of their own volition. In one, prophylaxis was inadvertently discontinued by me when I confused her with her sister. One patient moved from the State and had no followup until his return to our program a year later. Another had no prophylaxis because of a history of urticaria following ingestion of penicillin and exfoliative dermatitis following sulfonamide treatment. She since has been on oral Bicillin for 6 months without difficulty. One patient discontinued his prophylactic treatment upon the advice of his family physician.

The shortness of time between the discontinuance of prophylaxis and recurrence of rheumatic fever compared with the average recurrence time without prophylaxis has been striking. In some cases, the recurrence time has been so short that it is obvious that only year-round prophylaxis is completely effective.

Four patients who had broken prophylaxis

developed significant (2 tube) rises in ASO titer. In no individual who maintained prophylaxis did we detect any significant rise in ASO titer.

Recurrence of Chorea

One of the most intriguing occurrences in the past 3 years has been the recurrence of chorea in nine patients who had maintained good prophylaxis. In none of these patients did "exudative" manifestations appear. There was no clinical, roentgenographic, or electrocardiographic evidence of progression of heart disease. Two patients required hospitalization. Chorea appeared in five patients between 3 and 4 months after it had been thought that all clinical evidence of rheumatic activity had disappeared. In three individuals, ASO determinations were done before, during, and after episodes of chorea. These titers showed a decline from the levels that had been present during their preceding acute episode of rheumatic activity. This lends rather strong support to the contention that chorea may be a greatly delayed manifestation of rheumatic fever. Two of the five patients who had early recurrence of chorea were on intramuscular Bicillin and three were on oral penicillin.

For the remaining four individuals, the time between the last clinically detected attack of rheumatic fever and the appearance of chorea varied from 2 to 4 years. Three patients were on oral penicillin. Their chorea appeared in 1953, at a time when we did not have an accurate record of the penicillin dispensed in the clinic, and we have only the word of the parents

reau Pub. No. 322. Washington, D. C., U. S. Government Printing Office, 1948.

- (2) Wannamaker, L. W., Rammekamp, C. H., Jr., Denny, F. W., Brink, W. R., Hansen, H. B., Hahn, E. C., and Dingle, J. W.: Prophylaxis of acute rheumatic fever by the treatment of the

preceding streptococcal infection with various amounts of depot penicillin. *Am. J. Med.* 10: 673-695 (1951).

- (3) Kelley, V. C.: The role of the pituitary-adrenal system in rheumatic fever. *J. Lancet* 75: 291-308, July 1955.

Air Pollution and Radiological Courses

Pittsburgh. Various aspects of air pollution will be the subject of study in a new program leading to the degree of master of science in hygiene at the University of Pittsburgh Graduate School of Public Health, Pittsburgh, Pa. The program will begin in September 1957 and continue through August 1958. It is open to applicants who have an engineering degree and adequate training in chemistry. Preference will be given applicants with some years of experience in engineering.

The program has been organized to meet increasing governmental and industrial demands for air pollution engineers who are broadly educated and are able to deal with both the technical and administrative aspects of the air pollution problem.

A lecture and seminar course in air pollution will include study of health, nuisance, and agricultural aspects; causes, sources, and characteristic emission rates; meteorological influences; and rate of dispersion from a source. In an air pollution laboratory and seminar course, students will study and apply air pollution measurements. One half of the year will be devoted to measuring contaminants in community atmospheres and the other half to field exercises in measuring source emissions. From the end of the spring semester through August, the student will complete a research problem as part of the requirements for the degree.

In addition to instruction pertaining specifically to air pollution, the program's full curriculum is designed to provide students with a good understanding of the basic physical and social relationships between man and

his environment. To this end, background courses such as principles of statistical reasoning, of epidemiology, and of public health practice; man and the environment; environmental physiology; industrial hygiene; industrial toxicology; and health physics are included.

Michigan. One of the country's first programs of integrated study in radiological health and safety will be offered by the University of Michigan School of Public Health, Ann Arbor, beginning in September 1957. The new program has been set up in response to growing demands for personnel highly trained in this field.

Courses scheduled to be given in September will be concerned with radioactive wastes and their disposal; the biological effects of radiation on man, plants, and animals; techniques used in studies of radioactivity; and methods of providing environmental protection.

The teaching and research staff in radiological health and safety has been expanded and the curriculum in environmental health reorganized to provide opportunities in the new program for intensive graduate study and for basic and applied research. In addition to teaching and research responsibilities, radiological health and safety staff members will assist in the university's program in the peacetime uses of atomic energy and will be represented in a team of University of Michigan consultants which has been requested to provide advisory services to the International Cooperation Administration.

be likely to result in complete discontinuation of prophylaxis.

Physician Education

It was hoped that the program would serve as a good medium for educating the referring family physician regarding criteria for the diagnosis of rheumatic fever and the value of prophylaxis. To determine how well this purpose has been served, the percentage of agreement between the referring physician's diagnosis and the clinic diagnosis and the percentage of rheumatic fever patients who were on prophylaxis when they were referred to the clinic were determined for each of the 3 years. In 1953, allowing a very liberal interpretation, the referring diagnosis agreed with the clinic diagnosis in 56 percent of the cases. In 1954 there was no appreciable difference (59 percent), but in 1955 this percentage had risen to 70 percent.

In 1953 only 4 percent of the individuals with rheumatic fever histories referred to the clinic were receiving prophylaxis; in 1954, 12 percent; and in 1955, 31 percent. This last figure is low inasmuch as many referrals were made with the specific request for prophylaxis even though the patients had actually not been started on prophylaxis. We feel that we have definitely made some progress in the education of private physicians regarding the importance of prophylaxis for the prevention of rheumatic fever. We have been aided in this phase of the program by the educational campaign of the Utah Heart Association. However, physician education is still one of the weakest facets of our program.

Costs

The yearly costs of the program during 1953-55 and the yearly costs for 1948-50, a period when the program was confined to the six northern counties of the State, offered complete medical services, and maintained a small convalescent hospital, are compared below:

| <i>Former program</i> | | <i>Present program</i> | |
|-----------------------|----------|------------------------|----------|
| 1948----- | \$22,590 | 1953----- | \$17,168 |
| 1949----- | 26,542 | 1954----- | 10,017 |
| 1950----- | 19,218 | 1955----- | 15,704 |
| <hr/> | | <hr/> | |
| Total----- | \$68,350 | Total----- | \$42,890 |

The fact that the present program now serves 22 of the 29 counties of the State and includes patients with congenital heart disease as well as patients with rheumatic heart disease makes these figures even more impressive.

Conclusions

Although our experience with a program of rheumatic fever prevention during the past 3 years has not resulted in any new concepts, it has added strong support to certain previously accepted principles. Our findings and conclusions are as follows:

1. The modified Jones criteria are valid and offer the best available means for accurate diagnosis of rheumatic fever.
2. Continuous prophylaxis against group A streptococcal infections prevents recurrences of rheumatic fever.
3. The four types of prophylaxis evaluated—sulfadiazine, penicillin, buffered penicillin G and benzathine penicillin—appear to be equally effective.
4. To be completely effective, prophylaxis must be continuous.
5. In some individuals considered to be maintaining good prophylaxis, chorea appears as a "delayed" manifestation of rheumatic fever and occurs without evidence of a preceding streptococcal infection.
6. Active participation of the family physician is the key to providing continuous prophylaxis.
7. Rheumatic fever occurs when the initiating streptococcal infection is treated with inadequate doses of penicillin.
8. In patients with acute rheumatic fever, hormone therapy in sufficiently large doses, as recommended by Kelley (3), appears to be effective in stopping progression of heart damage.
9. To care for and control children with rheumatic fever and rheumatic heart disease, a program offering consultation and followup and primarily emphasizing prophylaxis is more effective and less expensive than a program offering complete care.

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Rapid Plas

JOSEPH PORTNOY, Ph.D.

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frontispiece

Patients learn how to balance on crutches before learning to walk with them. A former patient instructs the class at the Institute of Physical Medicine and Rehabilitation in New York City.

What Is Mental Illness?

PHS Publication No. 505 (Health Information Series No. 88). 1957. 2-fold leaflet. \$3.00 per 100.

This leaflet describes briefly and generally the major classifications of mental disorders: the psychoses, the neuroses, and personality disorders. Also discussed are the causes of mental illness, what research is being done, facilities for treatment, and recovery chances for the mentally ill.

The importance of the attitude of the family and the community in rehabilitating the mentally ill is stressed.

Sunburn and Suntan

PHS Publication No. 104 (Health Information Series No. 1). Revised 1957. 1-fold leaflet. \$2.00 per 100.

All persons interested in getting a suntan or in avoiding suntan and sunburn will find the information in this leaflet an invaluable aid. Discussed are exposure precautions, pharmaceutical preparations, and what to do in case of sunburn.

Salaries of State Public Health Workers, August 1956

PHS Publication No. 524. 1957. 41 pages.

The study of salaries paid to selected classifications of personnel employed by State and Territorial health departments is the eighth of a series started in 1947.

Data for this study were taken from August 1956 State and Territorial health department payrolls. It includes salaries of health officers; program directors of dental public health, sanitary engineering, laboratories, public health nursing, business administration, and directors of vital statistics or records (or

both). Graphs and tables showing salary distributions are also included for the following occupational groups: medical personnel, exclusive of State health officers, sanitary engineers, sanitary personnel, public health nurses, nutritionists, health educators, analysts and statisticians, nonmedical administrators, dentists, veterinarians, and for the first time, medical and psychiatric social workers.

A major change in presentation of data is the tabulation by Bureau of the Census regions rather than by individual States. This change was made to expedite comparisons with other salary studies of national scope, which generally use the census regions to portray geographic variations.

Guide for a Tuberculosis Control Program for General Hospitals

PHS Publication No. 516. 1956. 12 pages. 15 cents

Discussed in detail are the essential elements of a tuberculosis control program for patients and personnel in general hospitals. Included are comprehensive plans for initial and followup examinations, and a time schedule for repeat tuberculin tests and chest X-rays.

A section is devoted to methods of coordinating hospital and other community services for the care of tuberculosis patients and their families.

Manual of Septic-Tank Practice

PHS Publication No. 526. 1957. 85 pages; illustrated. 35 cents.

The new Manual of Septic-Tank Practice has been prepared by the Division of Sanitary Engineering

Services in cooperation with the Joint Committee on Rural Sanitation for use as a guide by health agencies, builders, installers, and others. It is the result of 5 years of study, laboratory research, and field trials. Much of the material is based upon results of extensive research carried on at the Robert A. Taft Sanitary Engineering Center, Public Health Service.

This work combines data from professional and technical organizations, official agencies, and industry. It also presents in one volume three previous technical reports on Studies on Household Sewage Disposal Systems.

Scientific Translations

A preliminary guide to sources and services

PHS Publication No. 514. 1957. 12 pages. 15 cents.

This guide represents an attempt to provide a directory of sources for finding and procuring translations of scientific literature, including data on cooperative translation programs, governmental agencies which collect or prepare translations, and a list of commercial translation services in the United States.

Although incomplete, the guide is offered at this time as a stop-gap measure for meeting the critical need for information in this field.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Rapid Plasma Reagin Test for Syphilis

JOSEPH PORTNOY, Ph.D., WARFIELD GARSON, M.D., M.P.H., and C. A. SMITH, M.D.

THE RAPID movement or concentration of relatively large numbers of persons into and within the United States has presented certain difficulties in the control of venereal disease. Examples of such movement and concentration of population can be seen among workers in industrial defense plants, migrant farm and marine laborers, immigrants, potential civil defense mass evacuation groups, and similar population concentrations.

Analysis of the problem as it relates to syphilis has suggested that more effective control might be realized by use of a serologic test which would permit rapid and economical screening supplemented by immediate on-the-spot specific and prophylactic treatment of reactors at the times and locations where they are assembled for processing and assignment.

To meet the requirements of a more rapid serologic test for syphilis, a substitute for the conventional serum specimen was needed since considerable time and labor are involved in the processing of blood to serum.

A review of the literature on the use of

The authors are with the Public Health Service. Dr. Portnoy is an immunoserologist, and Dr. Garson is director, Venereal Disease Experimental Laboratory, Chapel Hill, N. C. Dr. Smith, deputy chief, Communicable Disease Center, Atlanta, Ga., was formerly chief, Venereal Disease Program, Division of Special Health Services, Washington, D. C. Technical assistance in the preparation of this paper was furnished by Jerry L. Smith, medical biologist, Venereal Disease Experimental Laboratory.

The paper was presented in part at the Eighth Annual Symposium on Recent Advances in the Study of Venereal Disease, Washington, D.C., April 24-25, 1957.

plasma in serologic tests for syphilis suggested that this type of sample might serve as the needed substitute for serum. Burdon (1, 2) noted that citrated plasma gave more sensitive results in the Kline and Kahn tests than did serum. The greater sensitivity of plasma was attributed to the presence of "more syphilitic reagin" in plasma than in serum. Fresh unheated plasma gave insensitive findings, but exposure at 56° C. water bath for 10 minutes was sufficient to raise the reactivity level to that obtained by heating for 30 minutes. It was necessary to centrifuge the plasma after heating to remove the precipitate which formed during the heating process.

Burdon noted that considerable time was saved by the substitution of plasma for the conventional serum specimen. Barnard and Rein (3) found certain objections, such as increased anticomplementary findings and turbidity of specimen, to the use of citrated plasma and utilized the procedure of recalcification with dicalcium phosphate to obtain a serum specimen from the parent citrated plasma. Listed as advantages of this type of specimen were greater resistance to hemolysis of the citrated specimen, ease of separation of the plasma without resort to centrifugation, and greater stability of reagin in stored citrated plasma.

The results on the recalcified plasma specimen had the same validity as those obtained with serum. However, the process of recalcification was rather laborious and time-consuming.

Barnard and Van Hala (4) substituted gypsum for dicalcium phosphate for recalcifying citrated plasma. The inactivation of the specimen was accomplished in the presence of the clot and an excess of gypsum. In reports

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Services in cooperation with the Joint Committee on Rural Sanitation for use as a guide by health agencies, builders, installers, and others. It is the result of 5 years of study, laboratory research, and field trials. Much of the material is based upon results of extensive research carried on at the Robert A. Taft Sanitary Engineering Center, Public Health Service.

This work combines data from

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEROY E. BURNET, *Surgeon General*

The serums were examined by the VDRL slide technique (11) in either the North Carolina State Board of Health Laboratory of Hygiene or a North Carolina county health department laboratory. The plasma specimens were either mailed or brought by messenger to the authors' laboratory.

Test Technique

Preparation of Antigen Suspension. VDRL slide test antigen emulsion (B) was prepared (11). Measured aliquots of the suspension were then centrifuged in stainless steel tubes in a Servall SS-1 angle centrifuge at room temperature at a relative centrifugal force approximately $2,000 \times$ gravity for 15 minutes. The supernatant was decanted and, while the stainless steel centrifuge tube was held in an inverted position, the wall of the tube was wiped with cotton gauze without disturbing the sediment.

A solution containing 10 percent choline chloride solution in 0.85 percent sodium chloride was used in resuspending the sedimented antigen. The volume of the resuspending solution was equal to the volume of the antigen suspension which was centrifuged and was added by blowing it directly onto the sediment.

Agitation of the centrifuge tube by hand was then performed to resuspend the antigen adequately. In early studies antigen suspension was prepared daily. Later it was found that the addition of merthiolate in a final concentra-

tion of 0.01 percent maintained the reactivity of the antigen for at least a week when stored at room temperature. The merthiolated antigen suspension was then used in the plasma test over a period of 1 week.

Preparation of Specimens. The blood specimens were centrifuged at room temperature at a force sufficient to separate the plasma from the cellular elements, usually 1,500-2,000 r.p.m. for 4 minutes. The plasma was allowed to remain in the original collecting tube. The specimens were then tested without heating.

Performance of Test. Boerner (C) concavity slides were used. Plasma and antigen suspension were measured with disposable capillary pipettes (D). For each specimen three drops of plasma were placed on one concavity. One drop of antigen suspension was then added to each plasma specimen. The mixtures were rotated on a mechanical rotator for 4 minutes at 180 r.p.m. The rotator circumscribed a circle three-fourths of an inch in diameter. Tests were read microscopically immediately after rotation, using $100 \times$ magnification, and recorded as reactive—large clumps; weakly reactive—medium clumps; nonreactive—small clumps or less.

Results

The results obtained with the RPR test in comparison with the standard VDRL slide test are given in table 1. Regardless of the type of

Table 1. Comparison of results of RPR test and VDRL slide test with a blood specimen

| Number cases | Anticoagulant | Results | | | | Percent reactive ¹ | | Percent agreement ¹ |
|--------------|-----------------------|-------------------|-----------------|-----------------|--------------|-------------------------------|------|--------------------------------|
| | | RPR test | VDRL slide test | | | RPR | VDRL | |
| | | | Reactive | Weakly reactive | Non-reactive | | | |
| 277 | Oxalate | { Reactive | 11 | 11 | 7 | 15.2 | 9.7 | 94.6 |
| | | { Weakly reactive | 0 | 5 | 8 | | | |
| | | { Nonreactive | 0 | 0 | 235 | | | |
| 114 | Heparin | { Reactive | 3 | 1 | 1 | 6.1 | 3.5 | 98.2 |
| | | { Weakly reactive | 0 | 1 | 1 | | | |
| | | { Nonreactive | 0 | 0 | 107 | | | |
| 1,218 | Potassium sequestrene | { Reactive | 25 | 43 | 14 | 9.1 | 6.3 | 97.2 |
| | | { Weakly reactive | 0 | 9 | 20 | | | |
| | | { Nonreactive | 0 | 0 | 1,107 | | | |

¹ Reactive plus weakly reactive.

of more recent studies of the use of plasma specimens in serologic tests for syphilis, which have included the employment of cardiolipin-lecithin antigens, Rein, Schwartz, and Kelcec (5) described a procedure for the conversion of heparinized plasma to serum by use of protamine sulfate. Converted plasma and conventional serum samples gave similar findings. Although the heparinized plasma could also be used in serologic tests, the formation of a precipitate upon heating made such a specimen less desirable for both flocculation and complement fixation tests.

Coleman and Appleman (6) reported on the study of plasma specimens obtained with four different anticoagulants. All plasma specimens were heated at 56° C. for 30 minutes and centrifuged to remove precipitated fibrinogen before performing tests. The results indicated that oxalated plasma used in flocculation and complement fixation tests gave reactions similar to those observed with serum; disodium sequestrene plasma yielded reactions similar to those obtained with serum in flocculation tests but gave a very high percentage of anticomplementary tests; treburon plasma produced variable results in flocculation tests and gave anticomplementary results with all specimens; finally, citrated plasma showed slightly more sensitive results in flocculation tests, and essentially similar reactions in complement fixation.

From the foregoing review it was evident that plasma would fit into a procedure for a rapid serologic test for syphilis, provided the plasma could be used directly without heating or subjecting it to time-consuming chemical procedures or cycles of centrifugation. The chief disadvantage to the use of unheated plasma or serum appeared to be the reduced sensitivity of the results obtained (2, 7). The possible association of this reduced level of reactivity with the presence of a labile factor, such as complement, suggested the use of a simple and rapid chemical method for inactivating this labile factor.

Unpublished experiments by the senior author using choline chloride indicated it was anticomplementary. The behavior of an antigen suspension containing choline chloride to differentiate the positive reactions occurring in

Rapid Test and Treatment Tried

The rapid plasma reagin test for syphilis was used in California this year as part of the program of examining Mexican farm workers entering the United States. At the reception center in El Centro, 47,579 workers were tested from April 16 through June 28. Blood specimens were examined and differential diagnoses completed on the spot. Workers with syphilis were treated and contact information was obtained before they left the center.

Of the 47,579 tests, 3,913, or 8.2 percent, were reactive, and an additional 685 were weakly reactive. Among the reactors diagnosed as syphilitic were 31 primary and secondary cases, 985 early latent cases, and 2,712 latent. The results of the RPR test compared favorably with those of other nontreponemal and treponemal tests done on a sample of about 1,600 specimens.

—WILLIAM J. BROWN, M.D., *chief, Venereal Disease Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga.*

leprosy from those occurring in syphilis (8) suggested trial of this antigen suspension with unheated specimens. The results obtained with unheated serums were highly encouraging. It was then found that such an antigen suspension could be used in a test with unheated plasma.

This preliminary report describes the rapid plasma reagin (RPR) test, presents some of the test findings, and discusses some of the potential applications of the procedure.

Collection of Blood Samples

Various anticoagulants were used in obtaining the plasma specimen, including heparin, potassium oxalate, and potassium sequestrene (4).

Duplicate samples, to obtain serum, were taken by venereal disease prevention and control centers and venereal disease investigators in all instances. Depending on the availability of particular blood collecting kits, these split samples were obtained by dual collection in B-D Vacutainer tubes, by the piggyback technique (9, 10), or by needle and syringe, dividing the sample.

was shown in table 2, nearly all of the cases wherein discrepancies between the RPR test and VDRL slide test were encountered represented treated cases of syphilis. In view of the prior notation of the greater specificity of the antigen suspension containing choline chloride when used in conjunction with heated leprosy serums of nonsyphilitic origin, these preliminary findings on unheated plasma are perhaps not unexpected.

In considering the potential applications of the RPR test, the cost of the test is of interest. It has been estimated that the cost of the RPR antigen per test dose is a fraction of 1 cent more than the cost of the conventional VDRL antigen test dose. However, if early experiences with stored antigen suspensions are substantiated, the cost of the RPR test might conceivably be lower than the cost of the VDRL test since it would be possible to utilize antigen suspensions more completely.

The most significant economies with the RPR test will probably be associated with time and personnel. The time and labor involved in bringing the serum specimen to the testing stage is considerable. These are markedly reduced by use of plasma directly from the blood collection tube. The individual specimen is ready for testing immediately after centrifugation.

Exclusive of the glassware employed in the preparation of the antigen suspension and the concavity slides, all other items are disposable, thereby eliminating washing and glass breakage. The present cost of the disposable pipette is a fraction more than 2 cents. This cost may be lowered with greater demand and perhaps with the development of a cheaper substitute. It is hoped, too, that a disposable plastic slide will be developed.

The RPR test might be of value in mass blood testing programs since it would require fewer man-hours to handle a given load than conventional serologic methods. The rapidity of the RPR test would make it valuable in screening large numbers of migrant laborers, immigrants, and industrial groups—operations in which speed is or may be most desirable, if not critical.

Another potential application of the RPR test is its use by venereal disease investigators or other authorized personnel in conducting on-

the-spot serologic testing. Present practice involves the collection and shipment of blood specimens to a distant laboratory. Upon receiving notice of the serologic findings the investigator must locate the individuals for further study and treatment. It is not always possible to find these patients. In a recent survey for syphilis among migrant farm laborers, 10 percent of nonwhite persons found to have positive serologic tests could not be located for treatment (12). By operating out of a base laboratory, which would supply prepared antigen suspension and other materials, and with a modicum of training, it would be possible for field personnel to collect and test blood at the source and take immediate action in those individuals giving reactive results.

Finally, the RPR test might also prove to be valuable (*a*) as an adjunct in planning for syphilis control among civil defense and major disaster evacuee groups, (*b*) in processing sudden mass immigration groups, (*c*) in hospital and clinical laboratories, and (*d*) in public health programs of a multiphasic nature, particularly in those situations where hematological or other studies require blood collected in anticoagulant.

Summary

A review of the literature on the use of blood plasma in serologic tests for syphilis suggested that plasma would fit into a procedure for a rapid serologic test, provided that the plasma could be used without heating or time-consuming chemical procedures or cycles of centrifugation.

Plasma and serum specimens from 1,609 syphilitic patients were tested. Sedimented VDRL slide test antigen emulsion was resuspended in 10 percent choline chloride and used in the plasma test. Blood specimens were centrifuged at room temperature, and the plasma was tested without heating. Mixtures of plasma and antigen were rotated on a mechanical rotator for 4 minutes at 180 r.p.m., and tests were read microscopically immediately after rotation.

The rapid plasma reagin (RPR) test on plasma was consistently more reactive than the VDRL slide test on serum, regardless of the

Table 2. Clinical histories on cases with disagreement between RPR and VDRL slide tests

| Anticoagulant | Serologic pattern | Number cases | Number with history of syphilis |
|----------------------------|---|--------------|---------------------------------|
| Oxalate..... | { RPR reactive..... VDRL nonreactive..... } | 7 | 16 |
| | { RPR weakly reactive..... VDRL nonreactive..... } | 8 | 6 |
| Heparin..... | { RPR reactive..... VDRL nonreactive..... } | 1 | 1 |
| | { RPR weakly reactive..... VDRL nonreactive..... } | 1 | 0 |
| Potassium sequestrene..... | { RPR reactive..... VDRL nonreactive..... } | 14 | 14 |
| | { RPR weakly reactive..... VDRL nonreactive..... } | 20 | 18 |
| Total..... | | 51 | 45 |

¹ 1 case could not be located.

² 1 case received numerous treatments for gonorrhea.

anticoagulant used, the RPR test was consistently more reactive than the VDRL test on serum. Highly significant differences between the two tests were noted for the 1,609 cases tested without regard to the type of anticoagulant used. In no instance was a reactive or weakly reactive result obtained in the VDRL test in the face of a nonreactive RPR test.

The differences in the percentage of combined reactive and weakly reactive findings obtained with the three anticoagulants should not be attributed to the anticoagulant used inasmuch as the samples collected were from different areas in North Carolina. However, the ratio of reactive RPR to reactive VDRL tests in the groups representing the three anticoagulants was fairly constant at about 1.5:1.

Clinical documentation on those cases giving discordant findings between RPR and VDRL tests is presented table 2). In 51 cases of disagreement, 45 or 88 percent gave a history of treated syphilis; 1 case could not be located.

Discussion

Several factors can be considered to account for the greater sensitivity of the RPR test as compared with the VDRL slide test with

serum. An obvious factor is the reactivity level of the VDRL slide test, which is set at a lower level than some of the other serologic tests for syphilis. Somewhat greater agreement in sensitivity would be expected if the more sensitive procedures were compared with the RPR test. However, these data are lacking at present.

Another factor is the enhancing effect of choline chloride on the reactivity level of the antigen. This effect has been shown to occur in tests with heated serums (8). In 112 syphilitic serums, all TPI reactive, 87.5 percent reactive results were obtained with the VDRL slide test, whereas 97.3 percent reactive results were obtained with antigen containing choline chloride. Still another factor may be the greater reagin content of unheated plasma as compared with the reagin content of heated serum. Barnard and Rein (3) have referred to the greater stability of reagin in stored citrated plasma than in the conventional serum sample obtained from whole clotted blood. The destruction of reagin due to heating of serum has been reported and review by Rein and Hazay (7).

The results thus far obtained do not indicate any lower degree of specificity of the RPR test as compared with the VDRL slide test. As

Influenza Epidemic Alert

Surgeon General LEROY E. BURNEY

For the first time in history, public health workers in this country are in the position of being ahead of an impending major epidemic, caused by a new variant of A-type influenza virus.

The cooperation of many groups has both forewarned us and given us the means to curtail the extent of the epidemic. We must take steps immediately if we are to make effective use of the means at hand.

Inoculation with a vaccine containing the newly discovered Asian strain influenza virus is the only preventive we have available. Six major pharmaceutical companies have been licensed by the Public Health Service to manufacture influenza vaccine, and all six companies report that they are working at an accelerated production schedule to produce at least 60 million cubic centimeters by February 1, 1958, enough vaccine to provide protection for one-third of the population.

Our job as public health workers is to encourage the use of every bit of the vaccine just as soon as it becomes available. It is expected that plans for purchase and distribution of vaccine will be worked out jointly in local communities by health departments, private physicians, hospitals, and other interested groups. Meanwhile, plans for meeting an epidemic situation nationally have been worked out cooperatively by the

Public Health Service, the Association of State and Territorial Health Officers, the American Medical Association, the American Hospital Association, the American Public Health Association, and various professional groups and voluntary health agencies.

National, State, and local joint planning is necessary not only to insure the widest possible use of available vaccine, but also to prepare for the probability that influenza in epidemic proportions will affect those who are unable to obtain vaccine or who do not avail themselves of it. It is conceivable that 20 percent of the population of an area may be stricken with influenza. This could cause serious disruption in industry, government, education, and essential services. Such circumstances would, of course, severely strain medical personnel and care facilities.

Thus public health, together with other professions in the health and allied fields, faces a unique challenge. The traditional tasks of surveillance, reporting, laboratory services, and the like must go on at an accelerated pace. At the same time, a tremendous job must be done in public information and education with respect to use of the vaccine. Finally, public health agencies have to plan and prepare for the emergency services that will be needed if and when an epidemic strikes.

anticoagulant used. In no instance was a reactive or weakly reactive result obtained in the VDRL test when the RPR test was nonreactive. In 51 of the 1,609 cases, the RPR test was reactive to some degree when the VDRL test was nonreactive. Of these 51 patients, 45 (88 percent) gave a history of treated syphilis; 1 patient could not be located.

The RPR test for syphilis may prove to be valuable for several reasons. It is more economical than the VDRL slide test. It requires fewer man-hours to examine a given number of specimens. It could be used for on-the-spot serologic testing by venereal disease investigators instead of sending blood specimens to distant laboratories. It might also prove to be valuable in planning syphilis control among civil defense and major disaster evacuee groups, in processing sudden mass immigration groups, in hospital and clinical laboratories, and in multiphasic public health programs.

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EQUIPMENT REFERENCES

- (A) The anticoagulant containing tubes were supplied by Tom Starling of the Becton, Dickinson & Co., Rutherford, N. J.
- (B) VDRL slide test antigen was supplied by Sol Rosenberg, Sylvania Chemical Co., Orange, N. J.
- (C) No. 66550 Micro Slide, Boerner. American Hospital Supply Co. Scientific Products Division, Evanston, Ill.
- (D) No. 67770 diSPO-pette. American Hospital Supply Co. Scientific Products Division, Evanston, Ill.

Symposiums on Industrial Health Problems

The effects of habituating drugs on industrial workers will be discussed in the morning of a full-day session on industrial health problems on November 14, 1957, during the annual meeting of the American Public Health Association in Cleveland, Ohio. For the afternoon meeting, the scheduled topic is the status of the pneumoconioses. The session will be co-sponsored by the occupational health section of the American Public Health Association, the Industrial Medical Association, and the American Industrial Hygiene Association.

In the United States, health agencies are receiving current information on confirmed or suspected outbreaks of Asian influenza in the *Morbidity and Mortality Weekly Report* issued by the National Office of Vital Statistics, Public Health Service.

The Public Health Service instructed its epi-

demic intelligence officers, assigned to local and State health departments, to assist health officers in investigating early signs of the occurrence of influenza. In addition, quarantine officers of the Service advised travelers from affected areas to see a physician if respiratory illness develops within 10 days after arrival in

Calendar of Major Events in the 1957 Outbreaks

April 18. Newspaper report of influenza outbreak in Hong Kong. Cable instructions from Walter Reed Army Institute of Research in Washington, D.C., to 406th Medical General Laboratory, U.S. Army, in Japan to investigate. Similar outbreak in Singapore.

April 25. U.S. aircraft carrier out of Hong Kong docked at Yokosuka, Japan. Influenza aboard. Throat washings from affected crew members taken by U.S. Army medical personnel and first isolation made at 406th Medical General Laboratory.

May 22. After analysis of 2 strains recovered in Japan, 1 strain from the Hong Kong outbreak, and 2 strains from Singapore, Walter Reed Army Institute of Research announced they were antigenically different from other type A influenza viruses. No detectable antibodies against new viruses found in personnel selected at random. New strains supplied to WHO International Influenza Center for the Americas and National Institutes of Health for distribution to six manufacturers of vaccine.

May 23. Division of Foreign Quarantine, Public Health Service, instituted measures to identify and follow up travelers from the Orient with respiratory disease.

June 2. Influenza on board vessels at Newport, R. I. Strains of virus from throat washings identified as Asian type. Throat washings taken at Norfolk, Va., on a vessel from Newport. Asian influenza virus identified. Cases on these vessels totaled 373; attack

rates ranged from 3 to 45 percent.

June 7. The first experimental vaccine was submitted to the Division of Biologics Standards, Public Health Service, for testing.

June 10. The Surgeon General of the Public Health Service met with advisory committee of physicians and health officers.

June 11. On a naval vessel entering San Diego after a training cruise, 78 of 130 crew members were ill with a respiratory disease later identified as type A influenza by virus isolation. Within 2 weeks, more than 70 percent of the crew were attacked, and 2,770 recruits were affected. Etiological agent confirmed as Asian strain virus.

June 12. The Surgeon General of the Public Health Service met with technical representatives of the licensed manufacturers of vaccine.

June 16. During the following week, 137 persons from Mare Island Naval Base, Calif., were hospitalized with respiratory disease.

June 17-30. At Fort Ord, Calif., 245 cases were confirmed as Asian strain influenza by virus isolation and serologic tests.

June 20. Two outbreaks of influenza reported in California civilians.

June 25. Representatives of the American Medical Association met with the Surgeon General of the Public Health Service on medical manpower utilization in event of an epidemic.

June 26. At least 200 cases of influenza, Asian strain, occurred among 1,800 persons from 43 States and

several countries attending a conference at Grinnell, Iowa. Of the first 12 cases, 11 were from California. After the conference, about 48 of those who had attended were reported ill.

July 10-24. Influenza among Boy Scouts at Jamboree in Valley Forge, Pa. First occurrence among California contingent of 1,000.

July 19. Reports from the Netherlands that certain serums from aged persons contain inhibitory substance for hemagglutination of Asian influenza virus confirmed at WRAIR.

July 24. Evidence of antibodies against Asian virus among certain elderly persons in Massachusetts indicated by tests at the Virus and Rickettsia Section of the Communicable Disease Center in Alabama. Significance of demonstration of inhibiting substance against Asian influenza in serums of aged persons remains undetermined.

Diagnosis of Asian virus in Boy Scouts confirmed at WRAIR, later at NIH.

July 31. Project at Veterans Administration Hospital, Livermore, Calif., on the use of irradiation with ultraviolet light in preventing spread of Asian influenza.

August 12. The Public Health Service released 502,000 doses of vaccine for the armed forces and civilians, civilian lots to be distributed through hospitals, clinics, and private physicians. The Service recommended that State and local governments give priority to vaccination of persons engaged in essential work.

Asian Strain of Influenza A

An influenza outbreak first noted in late April 1957 in Hong Kong, chiefly among recent refugees from China, was followed rapidly by others in Singapore, Taiwan, the Philippines, and the Malay States. On request from Walter Reed Army Institute of Research, United States military laboratories near these areas, notably the 406th Medical General Laboratory, U. S. Army, at Zama, Japan, promptly undertook study of the epidemiology of this disease, which appeared to be highly communicable but not ordinarily fatal.

The infection attacked on the average an estimated 18 to 20 percent of the population in affected areas. Incidence in certain localities was reported as high as 60 percent. Characterized by rapid onset, fever, malaise, muscular aches and pains, and coryza, the disease lasts 3 to 5 days. Mortality, occurring mostly in infants and debilitated persons, has been less than 1 per 1,000 cases.

On April 25, Army medical teams in Japan took throat washings from affected crew-members of a United States aircraft carrier recently out of Hong Kong, and, on noting that isolated virus strains appeared unusual, sent the isolates to the United States for antigenic analysis. These strains together with others recovered from the epidemics at Hong Kong and Singapore were analyzed at the Walter Reed Army Institute of Research in Washington, D. C. On May 22, the Walter Reed laboratory announced the virus to be type A influenza, but strikingly different antigenically from previously known strains of this type, and reported the findings to the World Health Organization, the Public Health Service, and the Armed Forces Epidemiological Board. Similar findings were reported shortly thereafter from the World Influenza Center in London and from Sir Frank Macfarlane Burnet's laboratory in Australia.

Tests of 30 serum specimens collected at random from personnel at Walter Reed Army

Medical Center showed no detectable antibody against the virus, further evidence of a new strain of influenza virus.

Precautionary Measures

On the basis of these findings, the World Health Organization alerted all influenza centers and distributed new strains for further intensive studies. Using prototype strains received from the Walter Reed Army Institute of Research, the WHO International Influenza Center for the Americas in the Communicable Disease Center in Montgomery, Ala., sent ampules of the strain A/Japan/305/57, samples of related strains, and hyperimmune serums to laboratories in the Western Hemisphere collaborating in the influenza study program. Studies are now under way at this center, as well as at the University of Michigan School of Public Health and the Walter Reed Army Institute of Research, on antibody reactions with various regimens for vaccination.

A number of strains of Asian influenza virus were sent in dried form by the Walter Reed Institute to the Division of Biologics Standards, National Institutes of Health, Public Health Service, for distribution to the six licensed manufacturers of vaccine. All six houses promptly began to produce experimental monovalent vaccine. Four contracted for full delivery of vaccine to the Department of Defense. Supplies for the public were expected by the industry to reach at least 60 million cubic centimeters by February 1, 1958.

Epidemic Reporting

The WHO International Influenza Center for the Americas and the World Influenza Information Center in London act as clearing-houses for news of influenza outbreaks anywhere in the world.

Influenza Epidemics During 1951-56

With a Review of Trends

SELWYN D. COLLINS, Ph.D., and JOSEPHINE L. LEHMANN

DEATHS from influenza and pneumonia in the United States have decreased steadily since 1900 except during the great pandemic of 1918-19. The greatest decrease began about 1937, with the advent of the sulfa drugs and, a few years later, of penicillin and streptomycin. Deaths from influenza and pneumonia, however, still rank among the first 10 causes of death in the United States and were sixth in 1955 (1).

Because influenza and pneumonia are of such major importance as a cause of death and because of the explosive nature of influenza, these diseases continue to be of great concern. The Influenza Information Center at the National Office of Vital Statistics, part of the World Health Organization Influenza Study Program in the United States, receives reports on local outbreaks of influenza and on the predominating strain of the virus involved in these outbreaks (2).

The weekly reports of mortality from influenza and pneumonia received by the National Office of Vital Statistics from the health departments of 62 large cities are the basis of this review. Since pneumonia is so often the termination of fatal cases of influ-

enza, mortality from influenza can hardly be separated from mortality from pneumonia. This study reviews excess mortality from influenza and pneumonia from the summer of 1950 through the summer of 1956. Previous papers have reviewed excess mortality during epidemics of these diseases from 1918 to 1951 (3-8).

Mortality Trend, 1900-56

The trend of influenza and pneumonia mortality for the registration States from 1900 and for groups of cities from 1910 is shown in figure 1.

For the purpose of showing the trend line on a comparable basis for the whole series of years, mortality rates from 1949 through 1955 were corrected by the ratio of the fifth to the sixth revision of the International Lists (9). Since the trend is plotted on a logarithmic scale which shows the percentage rather than the actual change in the rates, the curve would remain the same except for a difference in its level.

The general downward trend in influenza and pneumonia mortality becomes more abrupt in 1937. This decline continues through 1954 but provisional data for 1955, based on the NOVS 10 percent sample, shows a small increase in influenza and pneumonia deaths.

The trend line for the cities parallels very closely the trend line for the registration States. The 62 cities in this study had a combined population in 1950 of 36,000,000. With the exception of four cities in the Mountain States, each city had a population of over 100,000. The

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the United States. Names and addresses of those ill with such a disease on arrival are forwarded to health officers in their home communities.

On June 10, the Surgeon General called the first meeting of the 10-member Advisory Committee on Influenza, formed of private physicians and public health officers. Committee members stressed the value of prompt reporting of suspicious cases, so that any occurrence of suspected influenza can be subjected to laboratory analysis through the State and local health department.

A statement by a number of medical organizations collaborating with the Public Health Service outlined specific procedure for physicians based on specifications of the WHO Influenza Typing Center for the Americas at the Public Health Service influenza laboratory in Montgomery, Ala.

"Optimally, the washings should be obtained during the first 3 days of illness and while the patient is still febrile, although virus may be recovered as long as 7 days after onset. The

patient should gargle 3 times, using about 15 ml. of diluent (broth, skimmed milk, or distilled water) and returning the washing each time to the paper cup. Some infective material may be brought from the trachea into the pharynx if the patient will cough. The washings should be transferred to a closed tube for transportation to the laboratory and tested as soon as possible. If a delay of more than a few hours is necessary, the fluid should be kept chilled at refrigerator temperatures. When longer periods of storage are unavoidable, the washing should be frozen and stored, preferably near 70° C. Serum samples should also be taken, one during the time of illness and a second, 2 to 4 weeks later.

"Not all laboratories are prepared to do virus isolation and serology for influenza. State health departments, however, can either do these procedures or refer the specimens to influenza reference laboratories such as the one at the Public Health Service's Communicable Disease Center Virus and Rickettsia Laboratory, Montgomery, Ala."

Dental Care for the Aged and Chronically Ill

A 4-year study to explore ways of providing dental care to the aged and chronically ill was launched by the Public Health Service in July 1957. The survey covers the Kansas City metropolitan area. During the first 6 months, investigators will study the dental needs of a sample of about 1,500 chronically ill patients in nursing homes and an undetermined number confined to the home.

The second phase of the study will concentrate on the administrative and organizational approach to the problem, supplementing technical research in this field. Collected data on costs and methods will be useful to communities planning programs for the chronically ill and aged who do not now receive dental care.

The University of Kansas City School of Dentistry has donated space for the study clinic; and Community Services, Inc., a nonprofit research agency in Kansas City, is assisting the Division of Dental Public Health, Public Health Service, in the project. Other voluntary and official agencies in the area will be called on to participate as the study progresses.

and on the Pacific coast, the 1953 rise in the mortality rates for influenza and pneumonia (shown in figures 1 and 2 for the United States and for the groups of cities respectively) is evident in each geographic section. In the winter of 1955-56, these rates increased in all geographic sections except the Middle Atlantic (table 2).

Excess Mortality

Weekly excess mortality has been used as the measure of size of outbreaks of influenza in previous studies of this series. The method of computing the normal seasonal curve has been described in detail in a preceding paper (3). For the years 1950-56 a seasonal expectancy for deaths from influenza and pneumonia was

based on a 5-year moving average of rates for the group of 62 cities for corresponding weeks of the 5 years ending in August 1955.

The seasonal expectancy was computed as follows: The moving averages of the 5-year means of rates were plotted on a large-scale chart and definite epidemic items were replaced by values interpolated by inspection. Adjustment for change in level of the actual rates was made at quarterly intervals by relating the average of these actual nonepidemic rates for each quarter of each year to the corresponding quarter of the normal seasonal curve to obtain a ratio of the actual to the expected rate.

Between these quarterly ratios (centering in the middle of each quarter) interviewing weeks were obtained by a straight line interpolation.

Figure 3. Trend of mortality from influenza and pneumonia in cities in each of eight geographic sections of the United States, 1935-56.

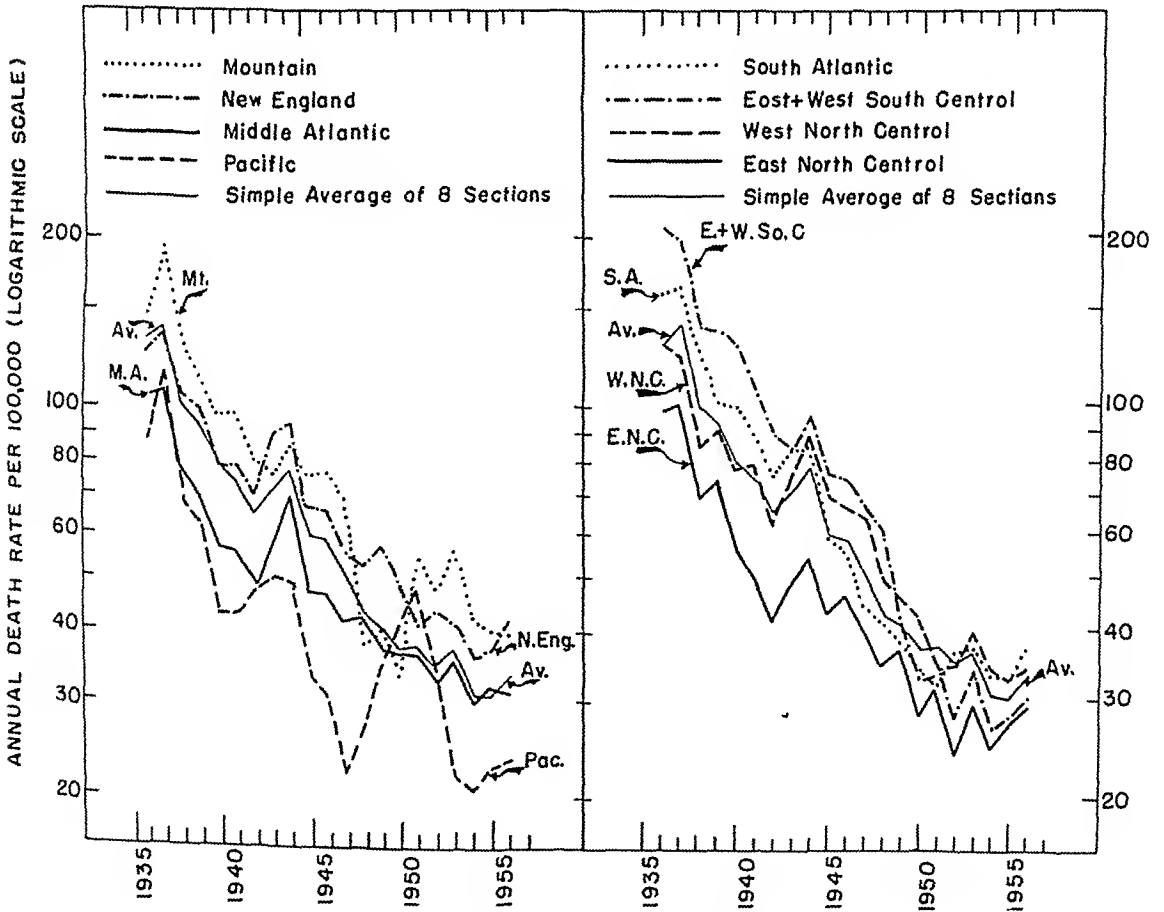
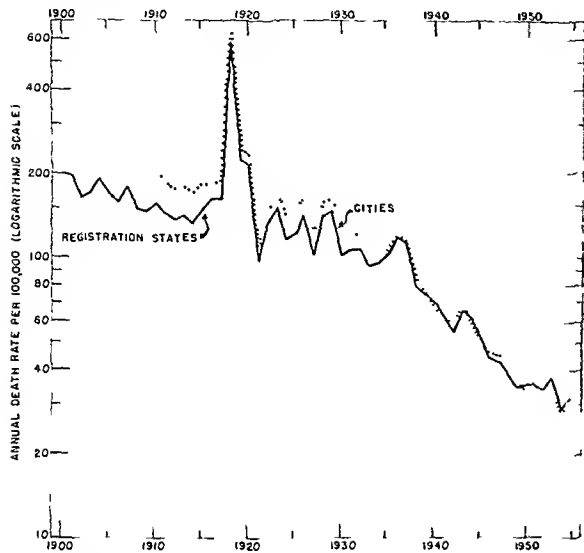
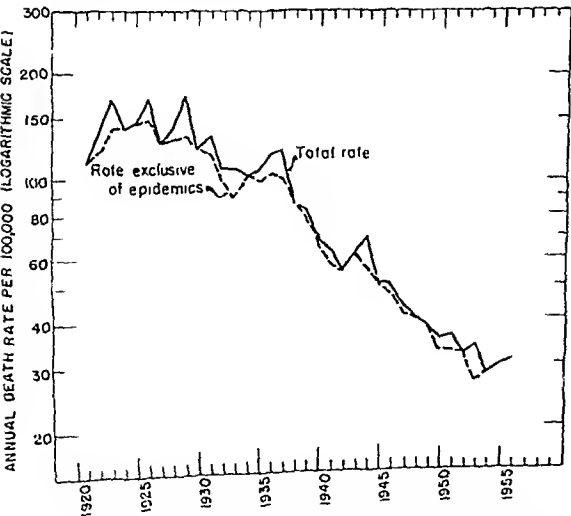


Figure 1. Trend of mortality from influenza and pneumonia in the registration States, 1900-55, and in groups of cities in the United States, 1910-55.



NOTE: Rates are for calendar years: 35 cities, 1910-19; 90 cities, 1920-42; 56 cities, 1943-50; 62 cities, 1951-55. Registration States rates for 1919-55 are plotted on the basis of the fifth revision of the International Lists (9).

Figure 2. Trend of mortality from influenza and pneumonia in groups of cities in the United States, including and excluding epidemic excess deaths, 1920-56.



NOTE: Rates are for years ending in mid-August, that is, 32d week of the calendar year. For data prior to 1913 see tables 1 and 3 of reference 8.

weekly death reports from the group of cities show about the same increase in mortality from influenza and pneumonia in 1955 as the 10 percent NOVS sample for the United States.

The trend of annual death rates from influenza and pneumonia for these same cities for the years ending in mid-August 1920-56 is shown in figure 2. The solid line shows the total rates and the dotted line shows the rates exclusive of excess deaths during influenza epidemics. For the winter of 1953-54, mortality rates are the lowest of any year for which influenza and pneumonia deaths have been recorded since the establishment of the registration area. Mortality rates for the years 1954-55 and 1955-56 seem to have followed a small upward course (table 1).

Table 1. Annual mortality from influenza and pneumonia in cities of the United States¹

| Year ending in mid-August (32d week) | Annual death rate per 100,000 | |
|---|---|---|
| | Including epidemic excess deaths | Excluding epidemic excess deaths |
| 1913 ² | 62.2 | 62.2 |
| 1914 | 70.4 | 56.0 |
| 1915 | 51.4 | 51.4 |
| 1916 | 51.2 | 47.5 |
| 1917 | 44.4 | 41.9 |
| 1918 | 41.4 | 41.4 |
| 1919 | 38.9 | 38.9 |
| 1920 | 35.6 | 32.9 |
| 1921 | 35.8 | 32.9 |
| 1922 | 32.8 | 32.8 |
| 1923 | 34.2 | 27.3 |
| 1924 | 28.8 | 28.8 |
| 1925 | 30.2 | 30.2 |
| 1926 | 31.3 | 31.3 |

¹ 56 cities, 1943-50; 62 cities, 1951-56.

² For years prior to 1913, see tables 1 and 3 of reference 8.

The trend of annual mortality rates for influenza and pneumonia by geographic area from mid-August 1935 to mid-August 1956 is shown in figure 3. As figure 1 shows for the combined group of cities, these are the years of the most dramatic decline in these rates. The 1913 epidemic is evident in all geographic sections. The mortality rates in 1950-51 and again in 1952-53 show the highest peaks for the Mountain area. Except in New England

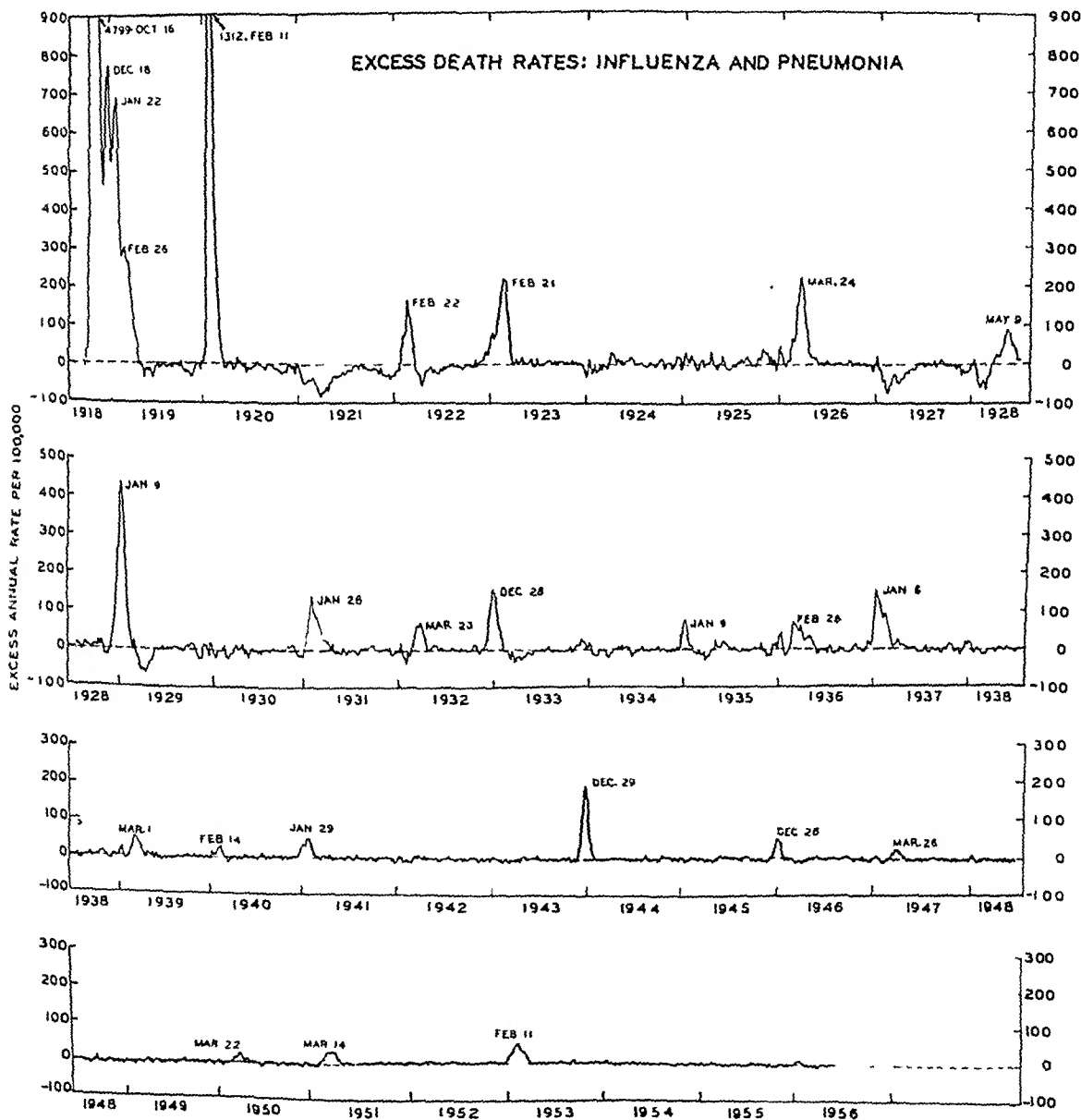
excess mortality. The total excess mortality for the whole of an epidemic is obtained by reducing the sum of the rates for the weeks involved from an annual to an actual basis.

The high mortality rates for all causes of death for the United States in January and

February of 1953 reflect the high mortality from influenza and pneumonia (2).

Table 3 gives a summary of the total excess mortality from these causes during epidemics in 1951-56, the date of the middle of the peak week, and the approximate length of each epi-

Figure 4. Weekly excess mortality (annual basis) from influenza and pneumonia in groups of cities in the United States, September 1918 to August 1956.



NOTE: Dates on charts are middle (Wednesday) of peak weeks. In 1920-29, excess rates are deviations from the smoothed median rate for corresponding weeks for the period 1921-27; in 1930 and later years, they

are deviations from average rates for corresponding weeks of years exclusive of or without serious epidemics, with adjustment for downward trend in non-epidemic rates.

The ratio for a given week of each year was applied to the rate for the corresponding week in the normal seasonal curve to obtain a seasonal expectancy for each week of each year. This quarterly adjustment, while rough, gives a fairly good approximation to the normal seasonal expectancy of influenza in each of the years in this study and a basis from which to derive the weekly deviations around this normal

expectancy. This same process was repeated for each of the geographic sections.

These data are shown in figure 4 for the group of 62 cities in the study. Since 1950 there have been two epidemics of influenza, a small one early in 1951 and a larger one in 1952-53. The 1952-53 outbreak is the largest since the epidemic of 1913-14 but only about half the size of that outbreak in terms of total

Table 2. Annual total mortality per 100,000 from influenza and pneumonia in 62 cities of eight geographic sections of the United States, 1951-56

| Year ending in mid-August (32d week) | All cities | New England | Middle Atlantic | East North Central | West North Central | South Atlantic | East and West South Central | Moun- tain | Pacific |
|---|---------------|----------------|--------------------|--------------------------|--------------------------|-------------------|--------------------------------------|---------------|---------|
| 1951 ¹ | 35.8 | 40.9 | 35.3 | 31.1 | 34.7 | 32.4 | 34.3 | 54.0 | 45.8 |
| 1952..... | 32.8 | 43.8 | 32.6 | 24.4 | 34.8 | 36.5 | 27.8 | 47.5 | 33.6 |
| 1953..... | 34.2 | 42.2 | 35.4 | 30.4 | 40.1 | 37.3 | 33.8 | 55.5 | 22.4 |
| 1954..... | 28.8 | 36.3 | 30.3 | 24.7 | 34.4 | 33.5 | 26.8 | 41.5 | 21.0 |
| 1955..... | 30.2 | 37.5 | 32.0 | 27.4 | 33.0 | 32.7 | 27.7 | 40.1 | 22.9 |
| 1956..... | 31.3 | 41.9 | 31.2 | 29.1 | 34.5 | 37.4 | 30.2 | 40.7 | 23.9 |

¹ For years prior to 1951, see table 4 of reference 3.

Table 3. Summary of period covered by epidemics and of the excess¹ mortality from influenza and pneumonia in epidemics in groups of cities² in the United States, 1951-56

| Date of epidemic and geographic section | Total excess mortality during whole epidemic per 100,000 population | Date of middle (Wednesday) of peak week | Actual excess per 100,000 for peak week | Total number of weeks included | Approximate dates of epidemic | |
|---|---|---|---|--------------------------------|-------------------------------|---------|
| | | | | | Beginning | End |
| <i>Early 1951³</i> | | | | | | |
| All cities..... | 3.8 | Mar. 14 | 0.64 | 10 | Feb. 11 | Apr. 21 |
| New England..... | 6.5 | Feb. 28 | 2.09 | 8 | Feb. 11 | Apr. 7 |
| Middle Atlantic..... | 5.0 | Feb. 28 | 1.15 | 9 | Feb. 11 | Apr. 14 |
| East North Central..... | 3.1 | Mar. 21 | .65 | 11 | Mar. 4 | May 19 |
| South Atlantic..... | 4.8 | Apr. 11 | .58 | 16 | Dec. 31 | Apr. 21 |
| East and West South Central..... | 5.3 | Feb. 14 | .87 | 11 | Feb. 4 | Apr. 21 |
| Mountain..... | 5.0 | Oct. 25 | 1.56 | 8 | Oct. 8 | Dec. 2 |
| Pacific..... | 6.0 | Mar. 14 | 1.05 | 12 | Feb. 11 | May 5 |
| <i>Early 1953</i> | | | | | | |
| All cities..... | 6.9 | Feb. 11 | .94 | 13 | Dec. 28 | Mar. 28 |
| New England..... | 4.5 | Feb. 18 | .76 | 11 | Jan. 4 | Mar. 21 |
| Middle Atlantic..... | 3.9 | Feb. 11 | .70 | 13 | Dec. 28 | Mar. 28 |
| East North Central..... | 3.4 | Feb. 11 | .65 | 11 | Dec. 28 | Mar. 14 |
| West North Central..... | 10.9 | Jan. 28 | 2.48 | 12 | Dec. 28 | Mar. 21 |
| South Atlantic..... | 6.8 | Feb. 25 | 1.38 | 11 | Dec. 28 | Mar. 14 |
| East and West South Central..... | 9.8 | Jan. 28 | 1.99 | 13 | Dec. 28 | Mar. 28 |
| Mountain..... | 13.0 | Jan. 28 | 2.52 | 14 | Dec. 14 | Mar. 21 |
| Pacific..... | 3.5 | Mar. 11 | .56 | 15 | Dec. 28 | Apr. 11 |

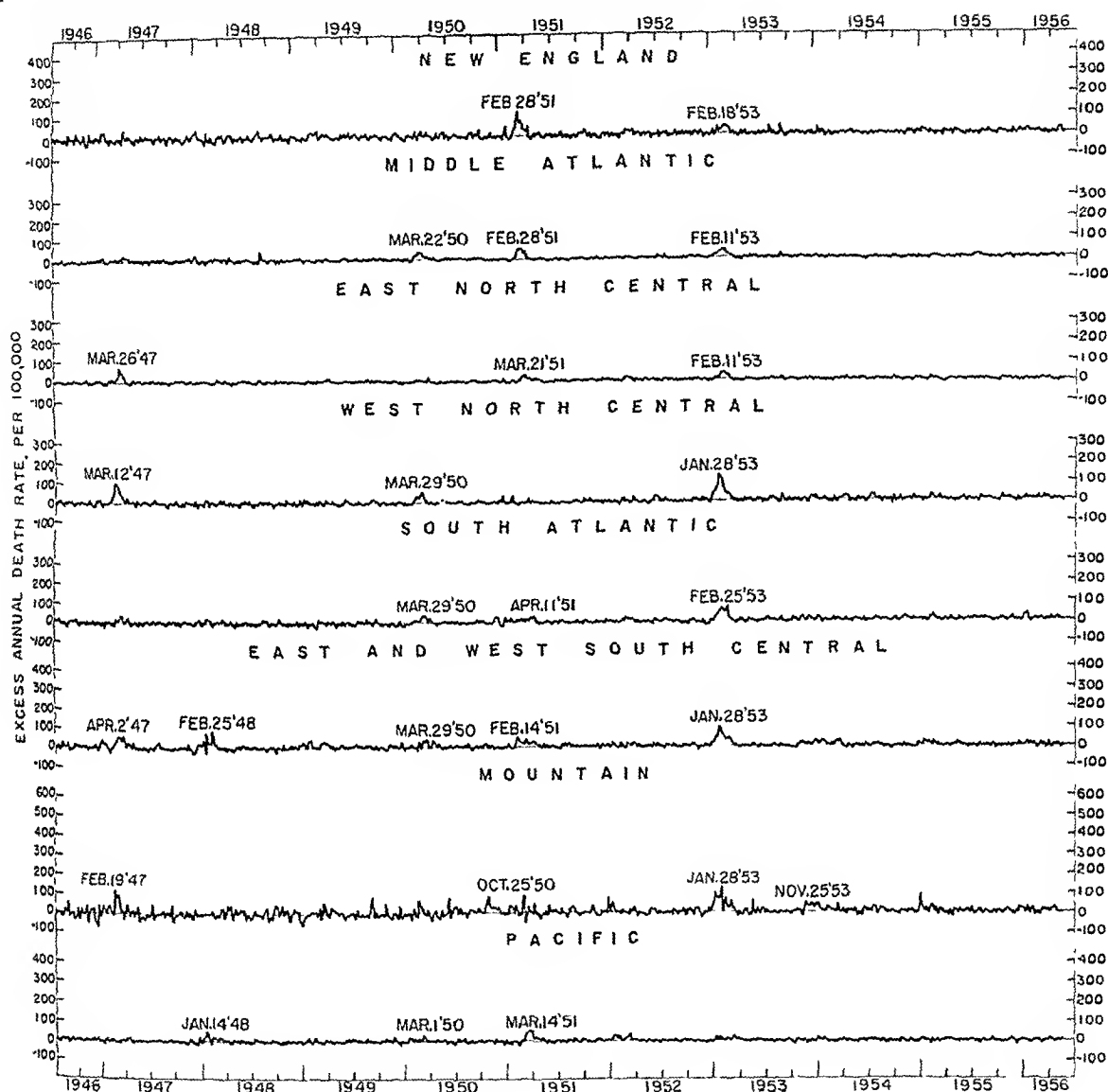
¹ For methods of computation see appendix to reference 3.

² For names of cities see appendix tables in reference 3. The 6 cities added to the Mountain section were Albuquerque, Colorado Springs, Ogden, Phoenix, Pueblo, and Tucson.

³ For years prior to 1951 see table 5 of reference 3.

NOTE: Geographic sections omitted from the table had no excess mortality from influenza and pneumonia during the particular epidemic.

pneumonia in groups of cities in each geographic section, 1936-56.



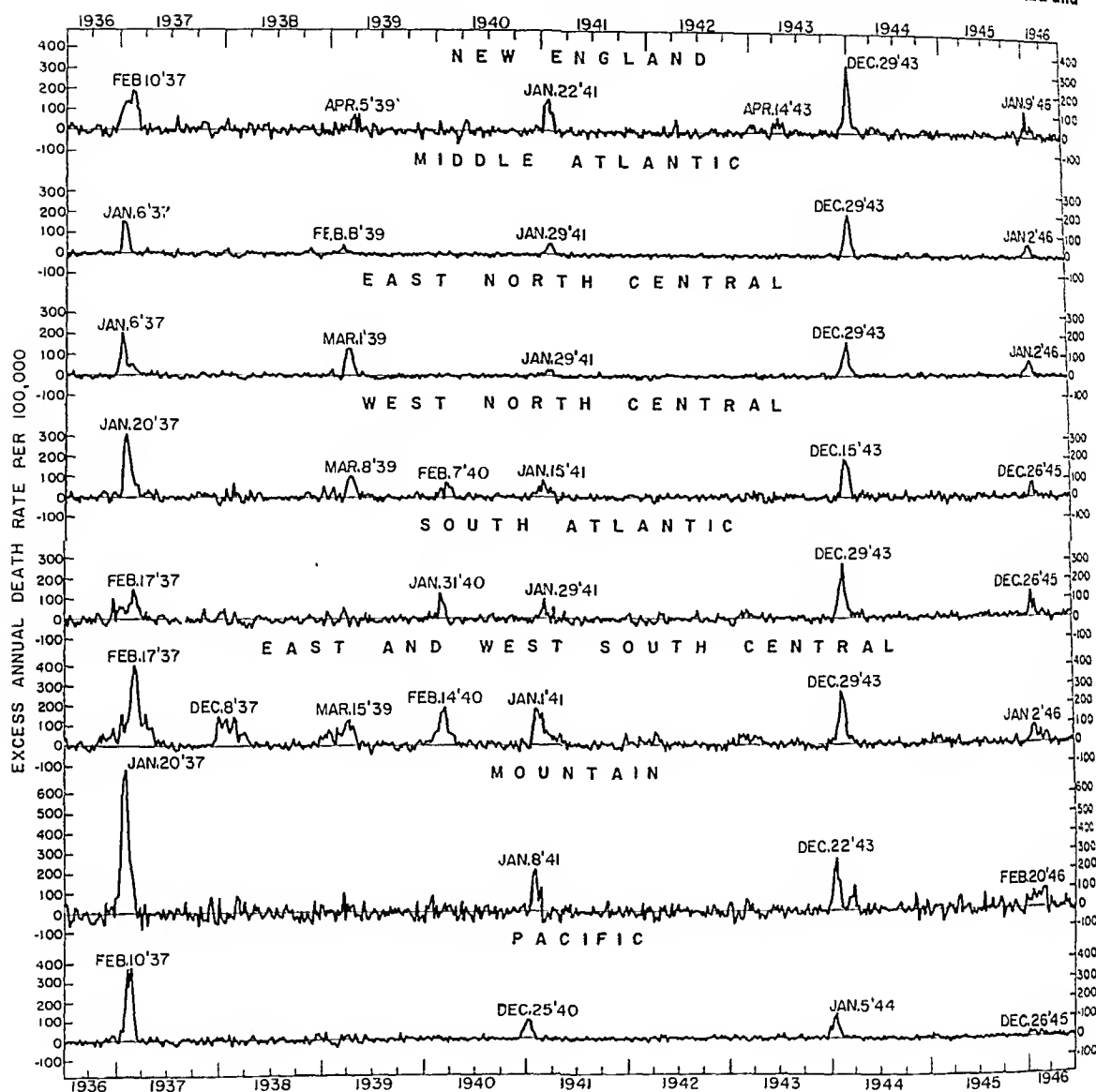
(10, 11). These four sections had the highest total excess mortality from influenza and pneumonia (fig. 5 and table 3). The epidemic of 1952-53 in the West North Central section, with a total excess mortality of 10.9 per 100,000 population, was the most severe of any outbreak in that region since 1943, although the mortality was only slightly higher than in the epidemic of 1947. The rates of excess deaths from these causes in 1953 in New England and the Middle Atlantic States were slightly lower than in 1951 and about the same in the East North Central section. The Pa-

cific section had a total excess mortality from influenza and pneumonia in 1951 of 6.0 per 100,000 but was affected very little in 1953.

In the previous report (3), data for the Mountain section were available for only 2 large cities, but since 1950 weekly reports have been obtained from 6 additional cities. This adds about half a million population to the Mountain area and probably accounts for the fact that the deviations from the baseline are not as irregular as in previous years.

Although the yearly mortality rates for influenza and pneumonia for the geographic sec-

Figure 5. Weekly excess mortality (annual basis) from influenza and



demic for the combined group of cities and for each geographic section where epidemics have occurred.

Excess Mortality in Geographic Sections

The weekly excess mortality from influenza and pneumonia, plotted for each of eight geographic sections from mid-August 1936 through mid-August 1956, is shown in figure 5. The United States census geographic sections are used in this study except that the East South Central and West South Central sec-

tions are combined. In 1950-51 there was no measurable excess of mortality from influenza and pneumonia in the West North Central section but moderate-sized epidemics are quite evident in all other sections.

In December 1952 some scattered outbreaks of influenza were reported to the Influenza Information Center and the National Office of Vital Statistics. By January 1953 these outbreaks had become quite widespread over the East and West South Central, the West North Central, and the Mountain sections, and in most of the States of the South Atlantic section

tions go up slightly for the first half of 1956 (fig. 3), the method used to determine excess mortality does not indicate an epidemic in any of the sections.

The weekly deviations in rates for all 62 cities in the study and the quarterly factors for adjustment of the normal seasonal curve to nonepidemic levels, from which these weekly deviations are derived, are shown in table 4.

Summary

The general trend of mortality from influenza and pneumonia has been downward since 1900, except during the great influenza pandemic of 1918-19. In 1900, the death rate from influenza and pneumonia was about 200 per 100,000 but by 1935 it had declined to about 100 per 100,000.

Beginning about 1937 with the advent of the sulfa drugs and, a few years later, of penicillin and aureomycin, the downward trend of deaths from influenza and pneumonia became more abrupt. In 1955 the provisional death rate for the United States from these causes was 27.5, a decline from 1935 of roughly 75 percent. The trend lines for the registration States and for the groups of cities reporting to the National Office of Vital Statistics have been consistently parallel and since 1937 lie very close together.

The same downward trend for the registration States and for the groups of all cities combined is seen in each geographic section.

Data on weekly mortality from influenza and pneumonia have been available for large cities in the United States since 1918. By the method used in this and previous studies to determine weekly excess mortality, there have been 21 epidemics since the 1918-19 pandemic. The most severe epidemics occurred in the decade 1920-29. The most widespread of these was early in 1920, with a total excess mortality of 99.3 per 100,000. Another severe epidemic occurred in the winter of 1928-29, with a total excess mortality of 44.4 per 100,000. In the next decade, the two most severe epidemics occurred in the winters of 1932-33 and 1936-37, with total excess mortality rates per 100,000 of 19.2 and 18.4, respectively. In the decade 1940-49, the only epidemic that compared in size with the epidemics of 1932-33 and 1936-37

was in the winter of 1943-44, when the total excess mortality from influenza and pneumonia was 14.4 per 100,000.

There have been two influenza epidemics since 1950. The first, in 1951, involved all geographic sections except the West North Central and had a total excess mortality of 3.8 per 100,000; the second, the most widespread since 1943-44, occurred in early 1953, with a total excess mortality rate of 6.9 per 100,000 for all cities combined.

• • •

Tables 5-12, giving the weekly deviations in mortality rates for influenza and pneumonia for the years 1951-56, are on file with the Division of Public Health Methods, Public Health Service, and may be obtained upon request.

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Table 4. Excess¹ weekly death rates (annual basis) per 100,000 from influenza and pneumonia, 1951-56, 62 cities²

| Week of year | Smoothed mean | 1951 ³ | 1952 | 1953 | 1954 | 1955 | 1956 |
|--------------|---------------|-------------------|------|------|------|------|------|
| 1 | 37 | +4 | 0 | +18 | +10 | +5 | +6 |
| 2 | 38 | +5 | +6 | +23 | +2 | -1 | +0 |
| 3 | 39 | -1 | 0 | +29 | -1 | -1 | +4 |
| 4 | 38 | +2 | -1 | +44 | +1 | -2 | -3 |
| 5 | 38 | -4 | -3 | +47 | -2 | -1 | -1 |
| 6 | 38 | +2 | -3 | +49 | -5 | +6 | -2 |
| 7 | 38 | +10 | -2 | +43 | +2 | +6 | -1 |
| 8 | 39 | +10 | -6 | +34 | -5 | +5 | -6 |
| 9 | 39 | +33 | 0 | +32 | -6 | +2 | -1 |
| 10 | 40 | +27 | +5 | +19 | +1 | -2 | -2 |
| 11 | 40 | +33 | +8 | +8 | -3 | -2 | -4 |
| 12 | 40 | +25 | +4 | +3 | -2 | -4 | -4 |
| 13 | 39 | +28 | +4 | -1 | +3 | -5 | +1 |
| 14 | 38 | +14 | +4 | -1 | 0 | -1 | +4 |
| 15 | 37 | +11 | -5 | -1 | -1 | 0 | +1 |
| 16 | 36 | +3 | 0 | -1 | +4 | -3 | -2 |
| 17 | 34 | -1 | -4 | +1 | +3 | -2 | -1 |
| 18 | 31 | +2 | -3 | +2 | -3 | -2 | +3 |
| 19 | 29 | +1 | -4 | 0 | -4 | -1 | +1 |
| 20 | 28 | +4 | +2 | +6 | 0 | -1 | 0 |
| 21 | 27 | -2 | 0 | -3 | -2 | +3 | |
| 22 | 26 | -1 | -1 | +1 | +2 | -1 | |
| 23 | 26 | -1 | 0 | +1 | +1 | -1 | |
| 24 | 25 | 0 | +1 | -2 | +4 | -2 | |
| 25 | 25 | -1 | +2 | -1 | +2 | 0 | |
| 26 | 25 | -1 | 0 | -1 | -4 | 0 | |
| 27 | 25 | -4 | +7 | 0 | -2 | +6 | |
| 28 | 25 | +1 | 0 | -5 | +2 | +5 | |
| 29 | 25 | -2 | +1 | +3 | +1 | +3 | |
| 30 | 24 | -4 | +6 | -3 | +2 | +2 | |
| 31 | 24 | +3 | +1 | -2 | +3 | +6 | |
| 32 | 23 | -2 | -4 | -4 | +2 | +4 | |
| 33 | 22 | 0 | 0 | -4 | 0 | -1 | |
| 34 | 22 | -2 | +1 | -3 | -2 | +2 | |
| 35 | 22 | -2 | -3 | +14 | -2 | -2 | |
| 36 | 23 | +1 | -1 | +11 | -1 | -6 | |
| 37 | 23 | +4 | -3 | -2 | 0 | -2 | |
| 38 | 23 | +2 | 0 | -1 | -4 | -4 | |
| 39 | 24 | -1 | -4 | 0 | 0 | -5 | |
| 40 | 25 | -2 | 0 | -2 | +5 | -4 | |
| 41 | 26 | -1 | -3 | -2 | -1 | -4 | |
| 42 | 26 | +1 | -1 | 0 | -1 | +1 | |
| 43 | 27 | -2 | +1 | -1 | -1 | +1 | |
| 44 | 28 | -2 | +3 | -3 | -4 | +1 | |
| 45 | 29 | +1 | +3 | -1 | -1 | -1 | |
| 46 | 30 | +1 | 0 | +2 | 0 | +5 | |
| 47 | 31 | +2 | +6 | 0 | +2 | -5 | |
| 48 | 32 | 0 | 0 | 0 | +2 | +1 | |
| 49 | 33 | +1 | +4 | +2 | -4 | -2 | |
| 50 | 34 | -3 | +3 | +5 | +1 | -1 | |
| 51 | 35 | -1 | +1 | 0 | -1 | +1 | |
| 52 | 36 | +3 | -2 | +2 | +4 | +6 | |
| 53 | | | +9 | | | | |

Quarterly factors for adjustment of means to current nonepidemic level

| | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|-------|
| 1st quarter (1st-13th weeks) | 1.223 | 1.140 | 0.773 | 0.901 | 1.009 | 1.018 |
| 2d quarter (14th-26th weeks) | 1.150 | 1.005 | .867 | .920 | .932 | |
| 3d quarter (27th-39th weeks) | 1.010 | 1.013 | .985 | .922 | 1.079 | |
| 4th quarter (40th-52d weeks) | 1.066 | 1.014 | .958 | .986 | 1.034 | |

¹ See footnote 1 to table 3. ² See footnote 2 to table 3. ³ For years prior to 1951 see appendix table A of reference 3.

Protective Isolation of the Tuberculous

CONFERENCE REPORT

Compulsory isolation of the tuberculous patient was considered at a Conference on Protective Isolation of the Tuberculous, held at Denver, Colo., January 22-23, 1957.

The meeting was designed also to identify the elements of a model compulsory isolation law and to develop specifics applicable to the State of Colorado, or, if this was not advisable, to attempt to develop an alternative solution to the problem.

The recalcitrant tuberculous patient and the need for methods of dealing with him have been subjects of increasing concern in recent months. Attending the meeting were interested persons from many fields as well as representa-

tives of numerous organizations from all over the United States. It was sponsored jointly by the Colorado Foundation for Research in Tuberculosis, Colorado State Medical Society, Colorado State Department of Public Health, Colorado Tuberculosis Association, Denver County Medical Society, Denver Department of Health and Hospitals, Denver Tuberculosis Society, National Tuberculosis Association, the University of Colorado School of Medicine, and the Public Health Service.

Chief participants in the conference were Dr. Lloyd Florio, manager of the Denver Department of Health and Hospitals and professor and head of

- and pneumonia in 50 large cities of the United States, 1910-29. Pub. Health Rep. 45: 2277-2328, Sept. 26, 1930.
- (8) Gover, M.: Influenza and pneumonia mortality in a group of 90 cities in the United States, August 1935-March 1943, with a summary for August 1920-March 1943. Pub. Health Rep. 58: 1033-1061, July 9, 1943.
- (9) World Health Organization: Manual of the international statistical classification of diseases, injuries, and causes of death. Sixth revision of the international list of diseases and causes of death, adopted 1948. I. Introduction. II. Alphabetical index. Geneva, World Health Organization, 1948, 1949.
- (10) Davis, D. J., and Dauer, C. C.: The occurrence of influenza in the United States, 1932-53. Pub. Health Rep. 68: 1141-1146, December 1953.
- (11) Davis, D. J.: Occurrence of influenza, July 1933 to June 1954. Pub. Health Rep. 69: 1150, December 1954.

Social Security Changes Affecting the Disabled

Recent amendments to the Social Security Act extend to persons severely disabled before January 1, 1955, a year's leeway in applying for a "freeze" of their social security records. The application deadline has been advanced from June 30, 1957, to June 30, 1958.

The amendments also provide that veterans with service-connected disabilities may receive full social security disability insurance benefits along with their full disability compensation from the Veterans Administration.

Under the social security disability "freeze" provision, the years during which a worker has no earnings because of his disability are not counted in figuring the benefits payable to him or his family in the future.

Until the enactment of the new amendments, disabled veterans receiving compensation from the Veterans Administration for service-connected disabilities had their social security disability insurance benefits reduced by the amount of their veterans compensation payment.

The first social security disability insurance benefits are payable to disabled workers aged 50 to 65 beginning with the month of July 1957.

The new amendments do not change the provision requiring that social security disability insurance benefits be reduced by the amount of any veterans pension for non-service-connected disability. This offset of benefits is also made where a disabled worker is receiving another type of Federal payment for disability or disability payments under a Federal or State workmen's compensation law.

ably influenced the infection rate in a community.

8. Since most laws permit a wide degree of administration and many of the patients who would be prosecuted are unable to defend themselves, such laws could easily lead to abuse by authorities. Civil liberties may be unnecessarily lost or curtailed.

9. Tuberculosis control officials have ample tools for protecting the environment from the recalcitrant. They know who he is. The unknown tuberculosis cases are the main hazard to the populace. The institution of forcible hospitalization would add nothing more to tuberculosis control than would a more vigorous application of those control methods now in use.

Handling the "Recalcitrant"

In the general discussion of the subject and its ramifications the conference expressed widely divergent opinions concerning the definition and importance of and the approaches to the problem. No general agreement was reached as to what constitutes a "recalcitrant," but the term usually was used to refer to patients who continue to expose other people to infection, deliberately, after all persuasive efforts to the contrary have failed. It was recognized that this designation is too loosely applied and that further consideration is needed of methods for prevention as well as for protection of the community without doing more damage to the patient. The conference was in general agreement that compulsory isolation relates only to a few persons, that this number could undoubtedly be further reduced with conscientious efforts, and that recalcitrance is not confined to one segment of our population, for instance, "the skid row bum," but may occur in any segment or socioeconomic group.

Methods of handling the recalcitrant tuberculous vary in different parts of the country. A few examples of the different types of experiences are fairly representative. In one area, it was reported, all tuberculosis patients who have had at least 1 to 10 opportunities to adjust to voluntary hospitalization are committed to a sanatorium operated under the

aegis of the sheriff's department. If they leave this sanatorium against advice after admission on an isolation order, they are arrested and may go to jail or back to the sanatorium depending on the circumstances and the sanatorium director's decision. This sanatorium has a special locked ward for the really antisocial and destructive patients where the same treatment is provided and disruption of the other wards is prevented. Good results are reported from 50 to 60 percent of the patients who change their attitudes or respond temporarily for the sake of expediency.

In another State a law makes refusal of examination a misdemeanor, but no penalty is stated and it is not known if the law is ever enforced. It is a misdemeanor in this same State for a tuberculous person to fail to follow his health officer's advice in regard to preventing the spread of tuberculosis to other persons, or to refuse to enter a sanatorium or hospital when this is found by the health officer to be necessary for the prevention of the spread of the disease. The sentence for this can be 2 years in the prison division of the sanatorium, subject to suspension if the patient enters a sanatorium. The patient can apply for parole from the prison division of the sanatorium after 60 days or for transfer to a State, county, or Federal sanatorium. He receives automatic release when medical conditions warrant. This same State also has a plan whereby the patient can be treated at home by a private physician.

In another State, if a suspect refuses examination, the judge appoints three doctors to examine him. If diagnosis of tuberculosis is confirmed, the person then is committed to the sanatorium until he is no longer a menace. About 100 patients are under isolation orders in this sanatorium, but there are only 54 beds in the locked ward. The committed patients are initially admitted to this ward and observed for 6 to 8 weeks by physicians and nurses. At the end of this time, if it is felt that the patient's attitude has changed and it is possible that he can be trusted on an open ward, he then is transferred and handled on the open ward as any other patient of the hospital. If this trust is not upheld or he leaves or attempts to leave the hospital against ad-

the department of preventive medicine, University of Colorado School of Medicine, moderator; Dr. Roger Mitchell, director of the Colorado Foundation for Research in Tuberculosis and associate professor of medicine, University of Colorado School of Medicine, chairman; Dr. Thomas Parran, former Surgeon General of the Public Health Service and present dean of the University of Pittsburgh Graduate School of Public Health, coordinator and summarizer; and Dr. Eric Wittkower, psychiatrist, Allan Memorial Institute, McGill University, Montreal, Canada, principal dinner speaker. Other participants were tuberculosis control officers, tuberculosis hospital directors, private practitioners, psychiatrists, sociologists, social workers, lawyers, nurses, and health educators.

Arguments Pro and Con

The first part of the 2-day session was devoted to a formal presentation of arguments in favor of and opposed to the use of forcible hospitalization. The case for compulsory hospitalization was led by Dr. Edward Kupka, chief, tuberculosis control, California State Department of Public Health. These arguments were offered:

1. Tuberculosis is a communicable disease spread from person to person. Its continued spread and the acquiring of new infections can be prevented by the identification and isolation of all grossly infectious persons.

2. The civil liberties of a citizen do not include the right to endanger the health and welfare of other citizens. It is a principle of law that the personal rights of an individual must at times be subservient to the common good.

3. Compulsory isolation can be recommended as a valid measure in the control of tuberculosis because it serves as a deterrent to other individuals with tuberculosis who might otherwise fail to cooperate.

4. The truly recalcitrant patient is both physically and mentally ill and at times needs the support of official action to help him take necessary precautions against infecting others. Some of these patients are so emotionally disturbed that commitment on psychiatric grounds is indicated.

5. The really recalcitrant patient is probably more dangerous to the public health than is the nonrecalcitrant known case. This is so because he is willfully neglectful of other people and makes no effort to protect his fellow men from infection. As the number of infectious tuberculous patients decreases, each such recalcitrant becomes relatively more important.

6. There is a small hard core of socially irresponsible persons who, in spite of a concerted psychosocial attack, will continue to expose their fellow men to infection unless restrained.

7. Basically democratic administration of isolation laws, like all laws, is a fair general assumption in the United States today.

8. Alternatives consist mainly in preventive measures which are too costly to be practical.

9. The program has worked well in those States with both a good overall tuberculosis control program and good facilities for compulsory isolation.

Dr. Sidney Dressler, medical director, National Jewish Hospital, Denver, led the case against compulsory hospitalization. His team set forth the following arguments:

1. Recalcitrance is not a crime and may reflect psychosocial disease in the patient or the failure of the professional staff to deal with this disorder, or both. Some of these problems are not due to any inadequacies within the patient, but result from improper handling by health officials.

2. Recalcitrance is usually preventable by proper medical, social, and psychiatric care.

3. Recalcitrants represent such a small fraction of the potential source of infection that the expenditure of time, effort, and money necessary for isolating them is not justified and might be better spent on other public health measures with a greater potential yield.

4. Enforced isolation as a rule does not make recalcitrant patients cooperative and, in fact, may drive tuberculosis underground and tend to create more recalcitrants.

5. There are adequate alternatives to enforced isolation.

6. Tuberculosis is only mildly contagious.

7. There is no evidence to show that compulsory isolation has succeeded in preventing additional cases or that incarceration has favor-

ably influenced the infection rate in a community.

8. Since most laws permit a wide degree of administration and many of the patients who would be prosecuted are unable to defend themselves, such laws could easily lead to abuse by authorities. Civil liberties may be unnecessarily lost or curtailed.

9. Tuberculosis control officials have ample tools for protecting the environment from the recalcitrant. They know who he is. The unknown tuberculosis cases are the main hazard to the populace. The institution of forcible hospitalization would add nothing more to tuberculosis control than would a more vigorous application of those control methods now in use.

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aegis of the sheriff's department. If they leave this sanatorium against advice after admission on an isolation order, they are arrested and may go to jail or back to the sanatorium depending on the circumstances and the sanatorium director's decision. This sanatorium has a special locked ward for the really antisocial and destructive patients where the same treatment is provided and disruption of the other wards is prevented. Good results are reported from 50 to 60 percent of the patients who change their attitudes or respond temporarily for the sake of expediency.

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vice, he again is returned to the locked ward. The hospital personnel then carefully explain to him that this procedure is not punitive but is for the protection of himself, the hospital, and the public. A committed patient is never given a medical discharge until he is listed as having inactive disease and consultation has been held with the county health officer in the jurisdiction in which he resides. A really refractory patient may be kept in the locked ward throughout his entire period of hospitalization. The locked ward has no guards or bars and the same facilities are provided patients there as are provided those on the open ward. Visiting takes place through a screen to prevent the transmission of forbidden articles such as liquor and narcotics. An electronic eye is situated at that point to set off an alarm if any patient attempts to escape.

In one large city where compulsory isolation of persons with tuberculosis who fail to cooperate with the public health authorities has been in use since 1940, an average of 63 persons have been committed each year. The accused person is brought to a court hearing by subpoena. If he does not appear in court, and about 50 percent do not, the judge issues a bench warrant instructing the police department to apprehend him and take him to the hospital. If the patient should escape or again become uncooperative with regard to medical management of his disease, a similar warrant is issued for his arrest and recommitment. No limit is set by the court on the duration of compulsory isolation, and the patient is discharged at the discretion of the medical director of the hospital on the recommendation of the chief of the locked ward service.

The locked ward is one of several large multibed wards for the tuberculous. Heavily screened doors, leading to and from that wing of the hospital, are locked and guarded by policemen. There are 23 beds on the ward, and the census varies from 15 to capacity. Most of the patients are social misfits, such as homeless men and skid row alcoholics, but a significant number have permanent homes and families. Most of them have moderately or far advanced disease, usually with cavitation and bilateral involvement.

Elements of Good Control

The philosophies expressed as well as the experiences described indicated the complexity of this problem. There were strong beliefs that the use of punitive methods (and that forcible isolation is punitive) is ineffectual in, if not actually detrimental to, tuberculosis control. The opposite point of view was expressed with equal conviction—that authority is a basic requirement for an adequate program. No differences of opinion were expressed, however, about the need to improve services and facilitate care, as an initial step in the prevention of recalcitrance among the tuberculous.

The following list of some of the elements of a good tuberculosis control program was submitted and approved unanimously:

- Abolition of the means test.
- Relaxation of residence requirements, especially where emergency treatment is needed.
- Good hospital facilities.
- Modern therapeutic methods.
- A reasonable freedom of choice among available facilities—as to location, convenience to the patient's home, and other considerations.
- The use of home care for suitable patients with treatment by the physician of the patient's choice.
- Adequate public assistance to the family.
- A well-rounded rehabilitation program.
- Effective and continuous psychological, psychiatric, and social service care.
- Education of the physician, especially since the role of the private physician in the treatment of tuberculosis is increasing.
- Strong public health services, including diagnostic facilities and the furnishing of drugs to physicians for patients entitled to them.
- Continuation of medical supervision of the tuberculosis patient by the health agencies.
- Coordination of all services, including education of the public, the legal profession, and the judiciary, in all aspects of the tuberculosis control program.
- The psychiatrist's continuing and important part in the prevention of unwillingness on the part of the patient to take treatment.
- Understanding attitudes on the part of all personnel, including individualization rather

than categorization of patients, and recognition that the patient's failure to accept recommendations often reflects improper handling rather than solely the patient's social and emotional disturbances.

The conference agreed unanimously on the statement:

"The conference deplors the use of compulsion as a substitute for adequate preventive and therapeutic measures of tuberculosis control including medical treatment, hospitalization, psychiatric treatment, public assistance, and social service. It recognizes, however, that in spite of such measures, occasional use of compulsion may be necessary in order to implement the total program."

The elements of a model protective isolation law were discussed, but time did not permit complete exploration of this topic and no general agreement was reached. The conference

pointed out that all States have old statutes dealing with communicable diseases that are applicable to tuberculosis and did not decide that new legislation for the isolation of the tuberculous recalcitrant was needed.

The conference recommended that the Public Health Service undertake studies designed to determine the extent and importance of the problem of the recalcitrant viewpoint, and to make an objective appraisal of the design and operation of compulsory isolation programs in a number of States and communities for the purpose of identifying those factors which contribute to the success or failure of such programs.

This conference report was prepared by the staff of the Tuberculosis Program of the Public Health Service from the transcript of the discussion and from written material submitted by the participants.

New Policy of National Library of Medicine

Requests for material from the National Library of Medicine must now be channeled through a medical or public library under a regulation effective September 1, 1957. The new rules unify interlibrary loans and photoduplication services. They are intended to make medical literature available more promptly wherever it is needed.

Beginning in September 1957, the library will—

1. Lend materials on an interlibrary loan basis only.
2. Determine whether to lend the material in the original form or as photoduplicates (microfilm or photoprints).
3. Allow borrowing libraries to retain loans furnished in the form of photoduplicates.
4. Furnish all such services free of charge, but will expect the borrowing library to pay postage charges for the return of borrowed books.

On the other hand, the National Library of Medicine will not—

1. Lend material to individuals; they are expected to direct their requests to their local libraries for transmittal.
2. Sell photoduplicates, except by special arrangement, usually for material in the history of medicine or art collections.
3. Furnish photocopy loans where the material is available to the borrower locally.

Details of the revised rules are obtainable from the Loan Librarian, National Library of Medicine, 7th Street and Independence Avenue SW., Washington 25, D. C.

Excessive Cigarette Smoking

The Public Health Service is, of course, concerned with broad factors which substantially affect the health of the American people. The Service also has a responsibility to bring health facts to the attention of the health professions and the public.

In June 1956, units of the Public Health Service joined with two private voluntary health organizations to establish a scientific Study Group to appraise the available data on smoking and health. We have now reviewed the report of this Study Group and other recent data, including the report of Dr. E. C. Hammond and Dr. Daniel Horn on June 5 to the American Medical Association in New York.

In the light of these studies, it is clear that there is an increasing and consistent body of evidence that excessive cigarette smoking is one of the causative factors in lung cancer.

The Study Group, appraising 18 independent studies, reported that lung cancer occurs much more frequently among cigarette smokers than among nonsmokers, and there is a direct relationship between the incidence of lung cancer and the amount smoked. This finding was reinforced by the more recent report by Dr. Hammond and Dr. Horn.

Many independent studies thus have confirmed beyond reasonable doubt that there is a high degree of statistical association between lung cancer and heavy and prolonged cigarette smoking.

Such evidence, of course, is largely epidemiological in nature. It should be noted, however, that many important public health advances in the past have been developed upon the basis of statistical or epidemiological information. The Study Group also reported that in laboratory studies on animals at least five independent investigators have produced malignancies by tobacco smoke condensates. It also reported that biological changes similar to those which take place in the genesis of cancer have been observed in the lungs of heavy smokers. Thus, some laboratory and biological data provide contributory evidence to support the concept that excessive smoking is one of the causative factors in the increasing incidence of lung cancer.

At the same time, it is clear that heavy and prolonged cigarette smoking is not the only cause of

lung cancer. Lung cancer occurs among non-smokers, and the incidence of lung cancer among various population groups does not always coincide with the amount of cigarette smoking.

The precise nature of the factors in heavy and prolonged cigarette smoking which can cause lung cancer is not known. The Public Health Service supports the recommendation of the Study Group that more research is needed to identify, isolate, and try to eliminate the factors in excessive cigarette smoking which can cause cancer.

The Service also supports the recommendation that more research is needed into the role of air pollution and other factors which may also be causes of lung cancer in man.

To help disseminate the facts, the Public Health Service is sending copies of this statement, the Study Group report, and the report of Dr. Hammond and Dr. Horn to State health officers and to the American Medical Association with the request that they consider distributing copies to local health officers, medical societies, and other health groups.

While there are naturally differences of opinion in interpreting the data on lung cancer and cigarette smoking, the Public Health Service feels the weight of the evidence is increasingly pointing in one direction: that excessive smoking is one of the causative factors in lung cancer.

The Service notes that the Study Group found that more study is needed to determine the meaning and significance of any statistical association between smoking and heart disease. The Study Group reported there is no convincing biological or clinical evidence to date to indicate that smoking per se is one of the causative factors in heart disease. Although the report by Dr. Hammond and Dr. Horn has since provided additional data on this subject, the Service feels that more statistical and biological data are needed to establish a definite position on this matter.

July 12, 1957

Copies of the report Smoking in Relation to Death Rates, by Dr. E. C. Hammond and Dr. Daniel Horn, and the Joint Report of the Study Group on Smoking and Health are available from the Division of Public Inquiries, Public Health Service.

Organic phosphorus insecticides may cause mild illnesses in persons working closely with the materials, but they did not constitute any hazard for residents surveyed recently in Wenatchee, Wash.

Exposure to Organic Phosphorus Sprays and Occurrence of Selected Symptoms

WAYLAND J. HAYES, Jr., M.D., Ph.D., ERNEST M. DIXON, M.D.,
GORDON S. BATCHELOR, M.S., and WILLIAM M. UPHOLT, Ph.D.

PESTICIDES are used intensively in agriculture in the vicinity of Wenatchee, Wash. Direct measurement of dermal and respiratory exposure of sprayer operators in this area to parathion was reported by Batchelor and Walker in 1954 (1). A survey designed to evaluate the hazard of organic phosphorus insecticides was carried out in this same locality during 1951 (2). It was found that definitely exposed persons showed a significant reduction

in average cholinesterase values and an increase in illnesses consistent with poisoning during the period of their exposure. There was no evidence of either reduced cholinesterase activity or increased illness during the spray season in persons with little or no exposure to insecticides.

This survey was continued during the 1952 and 1953 seasons. The present paper presents the results of that work.

Dr. Hayes is chief of the Toxicology Section, Technical Development Laboratories, Communicable Disease Center, Public Health Service, Savannah, Ga. Dr. Dixon was stationed at the CDC Wenatchee Field Station, Wenatchee, Wash., when this study was made. He is now at the Kettering Laboratory, University of Cincinnati College of Medicine. Mr. Batchelor was the entomologist for the Wenatchee Field Station, and is now with the Allied Chemical and Dye Corp. in Wenatchee. Dr. Upholt is chief of the Wenatchee Field Station.

Kenneth C. Walker, a chemist at Wenatchee, determined the cholinesterase activity of the blood samples for the study, and Dr. William F. Durham, a biochemist at the CDC laboratories in Savannah, assisted in preparing the report. Dr. J. Monte Johnston and Dr. W. T. Sumerford participated in the early phases of the surveys while they were stationed at Wenatchee.

Materials and Methods

The procedure was essentially the same as that used in the 1951 survey (2). The subjects were again grouped according to decreasing potential exposure as follows: mixing-plant personnel (MPP), commercial applicators (CA), part-time applicators (PTA), workers in orchards (WO), fieldmen, warehousemen, and miscellaneous workers (FWM), residents living near orchards (RNO), residents of Wenatchee area living far from orchards (RFO), and a control group of residents living completely outside the agricultural area (ROA).

The four exposure periods were again based on the best information which could be obtained regarding exposure to insecticides for each individual. The observations on the potentially

exposed groups (RNO and RFO) and the definitely unexposed group (ROA) were divided into periods based on the observed periods of exposure for the exposed groups. The periods were preexposure, exposure, recovery (arbitrarily taken as the 30-day period immediately following the last exposure of the season), and postrecovery. Also included in the recovery period were any data obtained from a person known to be in a convalescent state following poisoning, provided that he avoided further exposure.

In 1952, 228 persons were studied, including 100 of the same subjects studied in 1951. A total of 923 blood samples were analyzed for erythrocyte and 927 for plasma cholinesterase activity, using the electrometric method of Michel (3). Two hundred and twenty of the subjects were interviewed periodically for symptoms, as well as history of exposure.

In 1953, 239 persons in four of the groups were studied: commercial applicators (34 persons), residents near orchards (62 persons), residents far from orchards (107 persons), and residents outside the area (38 persons). These groups were selected to represent occupationally exposed (CA), potentially environmentally exposed (RNO and RFO), and definitely unexposed (ROA) populations. Cholinesterase determinations were not carried out on these subjects. In this year an effort was made to achieve greater statistical significance for the survey of symptoms by (a) increasing the number of observations in each group and (b) equalizing, insofar as possible, the number of observations from the various exposure periods. Most of the participants were interviewed each month, starting in some instances as early as March and extending through November or December. In an effort to assure as much uniformity of sampling as possible between the exposure periods, no individual participant was included in the final tabular summary unless he had been interviewed at least once in each of three periods, including both the preexposure and the exposure periods.

Cholinesterase Values

The results of the cholinesterase activity determinations are given in table 1. The groups

with occupational exposure (MPP, CA, PTA, and WO) showed a definite decrease in plasma cholinesterase levels and some diminution in erythrocyte enzyme values during the exposure period. Though the decrease in mean values was not great in any group, it was largest in the group with the heaviest exposure, the mixing-plant personnel. The lowest values (cells, 0.05; plasma, 0.09) encountered during the exposure period were in a person living near an orchard. These extremely depressed cholinesterase activity levels were the result of a near-fatal, acute case of organic phosphorus poisoning suffered by a 2-year-old child who had played with a can from which the original contents of 25 percent emulsifiable parathion concentrate had not been completely removed. The poisoning incidents reported by Johnston (4) and Dixon (5), as well as several unpublished cases, support the conclusion that, although extensive day-to-day exposure is regularly associated with reduced blood cholinesterase activity, the only fatal and near-fatal cases of poisoning which were found were associated not with long-standing exposure but with brief, massive exposure and gross carelessness.

In the recovery period, the average plasma enzyme values of 3 of the 4 occupationally exposed groups (MPP, PTA, and WO) had returned essentially to their normal levels. The commercial applicators still showed a somewhat depressed average plasma cholinesterase level at this time. For two of the groups with greatest exposure (MPP and CA), the erythrocyte enzyme levels were still significantly subnormal during the recovery period.

Few postrecovery samples were obtained. The values found were all in the expected range except for one low plasma value for a single resident near an orchard. This low plasma value, which was associated with a normal red cell value, must be considered characteristic of the individual in question because it continued low after an appreciable time with no possible exposure.

It is of interest to note that the average pre-exposure cholinesterase levels of individuals living in an intensively sprayed area are essentially the same as those of individuals living in unsprayed areas. The three less-exposed

Table 1. Cholinesterase values for various occupational and control groups in relation to exposure to organic phosphorus insecticides, Wenatchee, Wash., 1952

| Group | Number of people | Number of samples | Cholinesterase values (Δ pH/hour) | | | | | |
|---------------------|------------------|-------------------|---|------|----------------|-----------|------|----------------|
| | | | Red blood cells | | | Plasma | | |
| | | | Range | Mean | Standard error | Range | Mean | Standard error |
| Preexposure period | | | | | | | | |
| MPP | 7 | 11 | 0.60-0.92 | 0.73 | 0.03 | 0.50-1.18 | 0.74 | 0.06 |
| CA | 16 | 28 | .61-.81 | .70 | .01 | .66-1.26 | .91 | .03 |
| PTA | 39 | 49 | .57-.90 | .71 | .01 | .40-1.18 | .85 | .01 |
| WO | 14 | 14 | .57-.84 | .70 | .02 | .54-1.12 | .83 | .04 |
| FWM | 12 | 21 | .58-.86 | .73 | .02 | .53-1.36 | .90 | .04 |
| RNO | 21 | 31 | .61-.90 | .72 | .01 | .45-1.17 | .80 | .04 |
| RFO | 12 | 26 | .50-.84 | .72 | .01 | .61-1.02 | .85 | .01 |
| ROA ¹ | 14 | 38 | .64-.88 | .73 | .01 | .54-1.28 | .92 | .04 |
| Exposure period | | | | | | | | |
| MPP | 8 | 24 | 0.15-0.80 | 0.62 | 0.03 | 0.14-0.81 | 0.57 | 0.04 |
| CA | 30 | 84 | .21-.92 | .64 | .03 | .14-1.10 | .67 | .03 |
| PTA | 59 | ² 165 | .41-.90 | .68 | .01 | .26-1.26 | .79 | .01 |
| WO | 13 | ³ 36 | .54-.84 | .68 | .01 | .49-1.05 | .74 | .02 |
| FWM | 29 | 79 | .45-.89 | .71 | .01 | .36-1.62 | .86 | .03 |
| RNO | 28 | 110 | .05-.94 | .69 | .03 | .09-1.19 | .76 | .06 |
| RFO | 15 | 59 | .50-.86 | .69 | .01 | .58-1.02 | .81 | .02 |
| ROA ¹ | 14 | ⁴ 59 | .58-.84 | .70 | .01 | .48-1.27 | .90 | .03 |
| Recovery period | | | | | | | | |
| MPP | 2 | 2 | 0.52-0.70 | 0.60 | 0.07 | 0.75-0.81 | 0.78 | 0.03 |
| CA | 16 | 22 | .09-.86 | .53 | .05 | .05-1.15 | .69 | .05 |
| PTA | 14 | ⁵ 14 | .38-.82 | .67 | .03 | .52-1.09 | .79 | .05 |
| WO | 3 | 3 | .62-.72 | .69 | .20 | .59-0.92 | .78 | .10 |
| FWM | 5 | 5 | .61-.82 | .72 | .04 | .46-1.08 | .83 | .10 |
| RNO | 6 | 7 | .18-.80 | .55 | .09 | .26-1.14 | .70 | .12 |
| RFO | 2 | 2 | .71-.74 | .72 | .02 | .96-0.98 | .97 | .00 |
| ROA ¹ | 9 | 9 | .60-.86 | .73 | .04 | .59-1.26 | .94 | .08 |
| Postrecovery period | | | | | | | | |
| MPP | 7 | 7 | 0.48-0.90 | 0.66 | 0.18 | 0.68-1.15 | 0.83 | 0.06 |
| CA | 4 | 4 | .55-.78 | .66 | .05 | .76-1.02 | .92 | .07 |
| PTA | 1 | 1 | | .78 | | | .87 | |
| WO | 4 | 4 | .59-.80 | .70 | .04 | .67-1.32 | .97 | .14 |
| FWM | 1 | 1 | | .64 | | | .48 | |
| RNO | 1 | 1 | | .76 | | | .69 | |
| RFO | 1 | 1 | | | | | | |
| ROA ¹ | 11 | 11 | .66-.92 | .75 | .02 | .60-1.27 | .98 | .07 |

¹ The averages for the year in this group were 0.72 for cells and 0.92 for plasma. Although this group was not exposed to the spray chemicals under investigation, the cholinesterase values were distributed on the basis of collection date to the four periods set up for the exposed groups. This distribution provided a control for any potential seasonal variation in cholinesterase values.

² Only 164 red cell values available.

³ Only 35 red cell values available.

⁴ Only 58 red cell values available.

⁵ Only 13 red cell values available.

Table 2. Occurrence of illness and of selected symptoms among various occupational and control groups in relation to exposure to organic phosphorus insecticides, Wenatchee, Wash., 1952

| Percent of observed illnesses exhibiting— | | | | | | | | | | | | | | | | | | | | | |
|---|------------------|---------------------|---------------------------------|-------------------|--------|---------------------|----------------------------|----------------|--------------------------------------|----------|--------------------------------------|----------|------------------------|-----------------------|------------------|---------------------|---|-----------------------------|--|----------|---------|
| Group | Number of people | Number of illnesses | Percent of persons with illness | Selected symptoms | | | | | | | | | | | | | | At least 1 selected symptom | Myositis or at least 3 other selected symptoms | | |
| | | | | Headache | Nausea | Weakness or fatigue | Pain or tightness in chest | Abdominal pain | Vertigo, fainting, or incoordination | Vomiting | Nervousness, drowsiness, or insomnia | Sweating | Cough or expectoration | Disturbance of vision | Loss of appetite | Shortness of breath | Nasal discharge, including postnasal drip | | | Myositis | Wheezes |
| | | | | | | | | | | | | | | | | | | | | | |
| Preexposure period | | | | | | | | | | | | | | | | | | | | | |
| MPP | 8 | 2 | 25 | | | | | | | | | | | | | | | | | | |
| CA | 30 | 13 | 43 | 31 | | | | 8 | | | | | | 50 | | | 50 | 0 | | | |
| PTA | 39 | 19 | 53 | 5 | | | 11 | 11 | | | 8 | 15 | | 8 | | 31 | | 62 | | | |
| WO | 7 | 4 | 57 | 50 | | | | | | | | | | | | | 5 | 32 | | | |
| FWM | 12 | 5 | 41 | | | | | | | | | 25 | | | | | | 75 | | | |
| RNO | 83 | 77 | 93 | 26 | 4 | 5 | 8 | 3 | 5 | 3 | 21 | 20 | | | | 20 | | 20 | | | |
| RFO | 119 | 116 | 97 | 30 | 6 | 10 | 8 | 9 | 2 | 4 | 23 | 14 | 3 | | | 40 | 3 | 78 | | | |
| ROA | 57 | 47 | 82 | 19 | 4 | 4 | 2 | 3 | 2 | 2 | 23 | 13 | 2 | 5 | 6 | 30 | 2 | 76 | | | |
| | | | | | | | | | | | | | | | | | 2 | 51 | | | |
| | | | | | | | | | | | | | | | | | | 17 | | | |
| | | | | | | | | | | | | | | | | | | 13 | | | |
| Exposure period | | | | | | | | | | | | | | | | | | | | | |
| MPP | 8 | 6 | 75 | 17 | | 33 | 50 | | | | | | | | | | | | | | |
| CA | 68 | 60 | 88 | 52 | 13 | 13 | 33 | 5 | 5 | 2 | 10 | 2 | 50 | | | | 50 | 67 | | | |
| PTA | 59 | 48 | 81 | 50 | 25 | 54 | 14 | 12 | 23 | 12 | 19 | 14 | 23 | 15 | 8 | 20 | 55 | 85 | | | |
| WO | 12 | 7 | 58 | 28 | 28 | 28 | | | 28 | 14 | 28 | 28 | 71 | 28 | 28 | 10 | 12 | 75 | | | |
| FWM | 28 | 20 | 75 | 30 | 5 | 20 | 40 | 15 | 15 | 4 | 20 | 20 | 25 | 10 | 10 | 28 | 14 | 71 | | | |
| RNO | 90 | 90 | 100 | 30 | 6 | 14 | 3 | 3 | 15 | 3 | 20 | 25 | 26 | 10 | 25 | 25 | 5 | 90 | | | |
| RFO | 122 | 117 | 96 | 40 | 8 | 15 | 9 | 12 | 3 | 6 | 26 | 3 | 24 | 4 | 3 | 40 | 6 | 66 | | | |
| ROA | 59 | 49 | 83 | 12 | 6 | 8 | 12 | 2 | 2 | 4 | 18 | 14 | 2 | 2 | 5 | 43 | 3 | 83 | | | |
| | | | | | | | | | | | | | | | | 26 | 2 | 57 | | | |
| Recovery period | | | | | | | | | | | | | | | | | | | | | |
| MPP | 2 | 0 | 0 | | | | | | | | | | | | | | | | | | |
| CA | 38 | 22 | 58 | 23 | 55 | 18 | 18 | 9 | 5 | 5 | 9 | 23 | 9 | | | 18 | 5 | 73 | | | |
| PTA | 14 | 8 | 57 | 75 | 12 | 50 | | 12 | 12 | 25 | 12 | 25 | 12 | 5 | | 12 | 12 | 75 | | | |
| WO | 3 | 3 | 100 | | | | 33 | | | | | | | | | | | 25 | | | |
| FWM | 5 | 2 | 40 | | | | 50 | | | | | 33 | | | 12 | 67 | 33 | 67 | | | |
| RNO | 54 | 48 | 89 | 23 | 2 | 10 | 2 | 6 | 4 | 4 | 25 | 100 | | | | 50 | | 50 | | | |
| RFO | 98 | 93 | 95 | 11 | 4 | 10 | 3 | 8 | 1 | 1 | 12 | 12 | 2 | | 2 | 31 | 2 | 62 | | | |
| ROA | 49 | 37 | 76 | 11 | 5 | 5 | | | | | 8 | 11 | 1 | 4 | 3 | 24 | 2 | 55 | | | |
| | | | | | | | | | | | | | | | | 19 | 3 | 41 | | | |
| | | | | | | | | | | | | | | | | | | 5 | | | |
| Postrecovery period | | | | | | | | | | | | | | | | | | | | | |
| MPP | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | |
| CA | 41 | 21 | 51 | 14 | | 5 | 5 | | | | | 24 | | | | 33 | | 0 | | | |
| PTA | 4 | 4 | 100 | | | 25 | | 25 | | | | 25 | | | | 25 | | 25 | | | |
| WO | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | |
| FWM | 4 | 1 | 25 | | | | | | | | | | | | | | | | | | |
| RNO | 63 | 61 | 97 | 26 | 10 | 20 | 2 | 11 | 2 | 10 | 2 | 25 | 2 | 2 | | | 0 | 0 | | | |
| RFO | 101 | 94 | 93 | 21 | 10 | 14 | 3 | 13 | | 7 | 10 | 24 | 2 | 3 | | 48 | 66 | 21 | | | |
| ROA | 61 | 54 | 89 | 15 | 13 | 13 | 2 | 13 | | 13 | 9 | 22 | | 11 | 2 | 37 | 71 | 20 | | | |
| | | | | | | | | | | | | | | | | | 56 | 22 | | | |

NOTE: Values are zero unless otherwise indicated.

groups (FWM, RNO, and RFO) as well as the definitely unexposed population (ROA) remained normal during all periods.

Symptomatology

The symptoms recorded during the 1952 survey are tabulated in table 2 in the same form used in the earlier study (2). The distribution of the nonspecific symptoms throughout the various groups and throughout the four periods showed no particular pattern. In contrast the selected symptoms listed in the table were noted much more frequently during the exposure period. This finding indicates that mild illnesses involving symptoms similar to those characteristic of organic phosphorus intoxication were significantly increased during the exposure period. However, on the basis of the 1952 survey, as was also true for the 1951 study, it was not possible to differentiate clearly among the various potentially exposed groups with respect to the incidence of this type of illness. In an effort to solve this problem, the protocol of the survey was modified somewhat for 1953, as described above.

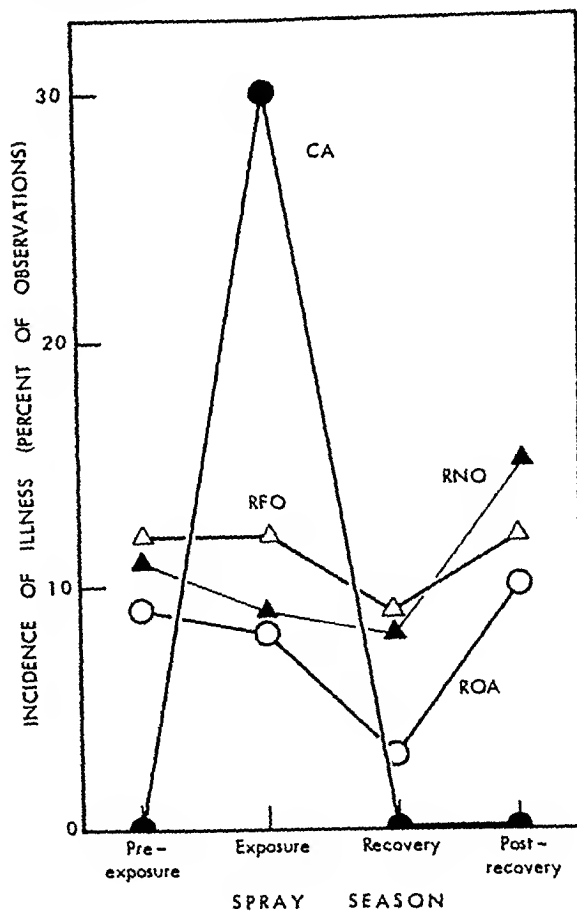
The symptoms recorded during the 1953 survey are shown in table 3. In this tabulation the incidence of symptoms and of illnesses is based on the number of observations, not on the number of illnesses or the number of persons as in table 2.

The incidence of all illnesses revealed that the commercial applicators were generally "healthier" than either the environmentally exposed groups or the unexposed group. The unexposed group had a slightly lower incidence of symptoms and of illnesses in all four periods than did the environmentally exposed groups (RNO and RFO). This lower incidence, however, is considered to be unrelated to exposure since these groups were different with respect to their potential contact with insecticides only during the exposure period.

The increase in illnesses among the commercial applicators during the exposure period was a result of an increase during this period in the selected symptoms known to be associated with intoxication by organic phosphorus compounds. The difference between periods was most apparent for the frequency of headache, nausea,

pain or tightness in the chest, and myosis. The significance of this trend can be seen by considering the incidence of myosis or of illnesses involving three or more of the other selected symptoms. As explained in the earlier report, the occurrence of myosis or of three or more other selected symptoms is a stronger indication of intoxication from organic phosphorus insecticides than is the occurrence of unselected symptoms or of any single symptom other than myosis. Each of the selected symptoms other than myosis occurs quite commonly as a result of conditions unrelated to exposure to insecticides, but they are not so likely to occur in combination without easily recognized etiology.

Incidence of illness involving myosis or at least three other selected symptoms among groups occupationally exposed (CA), environmentally exposed (RNO and RFO), or unexposed (ROA) to organic phosphorus insecticides, Wenatchee, Wash., 1953.



The incidence of myosis or of three or more of the other selected symptoms is shown in figure 1, as well as in table 3, for each of the groups. Especially in view of the generally lower incidence of symptoms of any kind among the commercial applicators, the great rise in this group in the incidence of illnesses involving myosis or three or more other selected symptoms during the exposure period is striking. Actually, 7 of the 8 illnesses in this group could be clearly correlated with known heavy exposure to either parathion or tetraethyl pyro-

phosphate. Six of them included myosis as well as two or more other selected symptoms. The eighth case was presumably a respiratory infection that was epidemic at that time.

Since the number of commercial applicators was very small, data for 18 such workers not included in the above analysis because they were missed in the preexposure period were also examined. These 18 were observed in the exposure period and at least once in the recovery or postrecovery periods. As shown in table 4, the inclusion of the observations for

Table 3. Occurrence of illness and of selected symptoms among various occupational and control groups in relation to exposure to organic phosphorus insecticides, Wenatchee, Wash., 1953

| Group | Number of people | Number of observations | Percent of observations revealing— | | | | | | | | | | | | | | | |
|---------------------|------------------|------------------------|------------------------------------|--------|---------------------|--------------------------------|----------------|--------------------------------------|----------|--------------------------------------|----------|------------------------|-----------------------|------------------|---------------------|-------------|-----------------------------|--|
| | | | Selected symptoms | | | | | | | | | | | | | Any illness | At least 1 selected symptom | Myosis or at least 3 other selected symptoms |
| | | | Headache | Nausea | Weakness or fatigue | Pain or tightness in the chest | Abdominal pain | Vertigo, fainting, or incoordination | Vomiting | Nervousness, drowsiness, or insomnia | Sweating | Cough or expectoration | Disturbance of vision | Loss of appetite | Shortness of breath | | | |
| Preexposure period | | | | | | | | | | | | | | | | | | |
| CA..... | 16 | 20 | 15 | | | | 5 | | | | | 15 | 5 | | 10 | 5 | | 70 |
| RNO..... | 62 | 108 | 17 | 2 | 3 | 5 | 5 | 2 | 2 | 17 | | 12 | 3 | 1 | 6 | 32 | 3 | 98 |
| RFO..... | 107 | 178 | 22 | 4 | 8 | 7 | 6 | 12 | 4 | 21 | | 18 | 2 | 4 | 2 | 25 | 12 | 97 |
| ROA..... | 38 | 56 | 16 | 5 | 7 | 2 | 2 | | 4 | 9 | | 14 | 2 | | 4 | 20 | | 82 |
| Exposure period | | | | | | | | | | | | | | | | | | |
| CA..... | 16 | 27 | 37 | 11 | 4 | 18 | | 4 | 4 | 4 | | 7 | 4 | | 4 | 22 | 18 | 81 |
| RNO..... | 62 | 159 | 19 | 2 | 6 | 1 | 2 | 3 | 1 | 18 | | 15 | 1 | | 1 | 26 | 2 | 98 |
| RFO..... | 107 | 268 | 23 | 3 | 7 | 4 | 6 | 1 | 2 | 19 | | 14 | | 3 | 2 | 24 | 1 | 94 |
| ROA..... | 38 | 65 | 9 | 5 | 6 | | 6 | 2 | 3 | 12 | | 8 | | | | 22 | | 86 |
| Recovery period | | | | | | | | | | | | | | | | | | |
| CA..... | 11 | 11 | 9 | | | 18 | 9 | | | | | | 9 | | | 27 | | 91 |
| RNO..... | 48 | 48 | 20 | 2 | 8 | | 6 | 2 | 2 | 22 | | 10 | | | 2 | 28 | 2 | 88 |
| RFO..... | 96 | 96 | 9 | 4 | 7 | 3 | 7 | | 1 | 11 | 1 | 13 | 1 | 4 | 3 | 22 | 12 | 95 |
| ROA..... | 32 | 32 | 9 | | 3 | | 6 | | | 6 | | 6 | | | | 16 | | 78 |
| Postrecovery period | | | | | | | | | | | | | | | | | | |
| CA..... | 16 | 26 | | | | | 8 | | | | | 4 | | | | 15 | | 65 |
| RNO..... | 62 | 110 | 20 | 6 | 12 | | 10 | 1 | 6 | 1 | | 17 | | | | 35 | | 95 |
| RFO..... | 100 | 184 | 13 | 5 | 10 | 2 | 1 | | 4 | 7 | | 15 | 1 | 1 | 2 | 28 | | 89 |
| ROA..... | 38 | 70 | 11 | 9 | 7 | | | | 9 | 3 | | 10 | | 7 | | 20 | | 84 |

NOTE: Values are zero unless otherwise indicated.

Table 4. Occurrence of illness and of selected symptoms among persons occupationally exposed to organic phosphorus insecticides, Wenatchee, Wash., 1953

| Item | Exposure period | Recovery period | Post-recovery period |
|---|-----------------|-----------------|----------------------|
| Number of individuals... | 34 | 22 | 34 |
| Number of observations... | 55 | 22 | 51 |
| Percent of observations revealing any illness... | 87 | 86 | 63 |
| Percent of observations revealing at least 1 selected symptom... | 67 | 59 | 33 |
| Percent of observations revealing myosis or at least 3 other selected symptoms... | 36 | 5 | 0 |

this group with those for the original group increases somewhat the incidence of illnesses involving at least one selected symptom and the incidence of myosis or of at least three other selected symptoms during the exposure period. Thus it strengthens the conclusion that there was a highly significant increase in this type of illness among occupationally exposed individuals during the period of exposure.

The occurrence of three or more selected symptoms was slightly more frequent among the environmentally exposed groups (RNO and RFO) than among the unexposed group (ROA) in all periods. (None of these groups reported myosis.) As suggested above, however, this difference was probably due to uncontrolled variables. Twelve of the eighteen illnesses involving three or more selected symptoms in the unexposed group were fairly definitely associated with etiologies unrelated to intoxication. Ten of the twelve were diagnosed as influenza or upper respiratory infection. One person had an operation for an intestinal obstruction, and another had cardiovascular disease. It is significant that of the 6 illnesses that were not adequately explained, 3 occurred in the preexposure period, 2 in the postrecovery period, and only 1 in the exposure period.

Of the 46 illnesses with three or more selected symptoms (but no myosis) found in the residents near orchards, 35 were fairly clearly associated with etiologies unrelated to insecticide exposure. These included upper respira-

tory infection, known allergies, pregnancy, peptic ulcer, and scarlet fever. The 11 that were not adequately explained were distributed 3 in the preexposure period, 3 in the exposure period, 1 in the recovery period, and 4 in the postrecovery period.

There were 84 illnesses revealing three or more selected symptoms (but no myosis) among the residents far from orchards; of these illnesses, 42 could be associated with etiologies unrelated to insecticide exposure, including about the same ones as those found in residents near orchards. Of the 42 illnesses that were not adequately explained, 15 occurred in the preexposure period, 16 in the exposure period, 6 in the recovery period, and 5 in the postrecovery period. With such a distribution there would seem to be little, if any, basis for associating these unexplained illnesses with exposure to insecticides.

Summary and Conclusions

A study of the effect of exposure to organic phosphorus insecticides carried out during 1952 and 1953, using some of the same subjects as those observed by Sumerford and his colleagues in 1951 (2), confirmed the previously demonstrated relationships between blood cholinesterase levels, exposure, and illness. It also provided further evidence that the occurrence of myosis or three or more other selected symptoms is a criterion for the differential diagnosis of mild poisoning. None of the results of the new investigation contradicted any conclusion stated in the first report.

In addition to these confirmatory findings, the present study showed clearly for the first time that illness resembling mild poisoning was not significantly more common in persons living in an agricultural community who had no occupational or gross accidental exposure than it was in persons living in a nonagricultural area, where insecticides were not used.

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PHS films

Clinical Manifestations of Leprosy

Part I. Tuberculoid Type

Part II. Lepromatous, Indeterminate, and Borderline Types

35-mm. filmstrip, color, silent with captions, 50 and 54 frames, respectively, 1956.

Audience: Physicians, public health officers, nurses, and medical students.



Part I of the filmstrip consists of a series of examples of tuberculoid lesions, each with a brief descriptive caption. The examples are limited to those found in the Westfort Institution, Pretoria, South Africa, and nearly all the patients are Negroes.

Part II shows 20 cases of the lep-

romatous type, 17 indeterminate, and 7 borderline, all Negro patients in the same institution. Each has its appropriate caption.

Refuse Disposal by Sanitary Landfills

16-mm. film, color, sound, 13 minutes, 472 feet. 1957.

Audience: Environmental sanitation personnel and other public health workers, municipal officials and civic groups.

The contributions of the sanitary landfill to community progress and public health are contrasted in this film with the faults of other disposal methods, such as open dumps, carrying vectorborne disease and nuisance hazards.



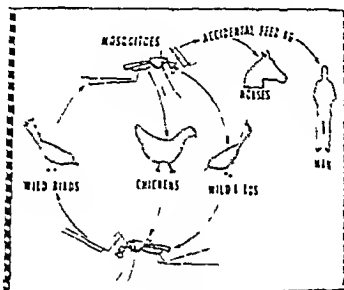
Children play on site of former landfill.

How to select a site, types of equipment used in landfilling, how to construct the fills, and different types of operating procedures are delineated.

Arthropod-Borne Encephalitis

16-mm. film, color, sound, 17½ minutes, 629 feet. 1957.

Audience: Epidemiologists, sanitary engineers, insect and rodent control personnel, and medical students.



The nature, significance, distribution, and known control measures for arthropod-borne encephalitis are delineated in this introductory film. The definition and importance of the disease, the three types and where they are found, human and equine cases, and temporary and permanent control measures are covered. The usual cycle of encephalitis transmission is from mosquitoes to wild birds. Infection of man and horses is believed accidental.

PHS films may be obtained on LOAN from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga., or PURCHASED from United World Films, Inc., 14½ Park Avenue, New York 29, N. Y.

Pertussis in Florida

ROBERT M. THORNER, M.P.H., and JAMES O. BOND, M.D.

PERTUSSIS killed more children than poliomyelitis in Florida in 1955, and three times as many cases of pertussis as of poliomyelitis were reported to the Florida State Board of Health. While remarkable advances have been made in the control of whooping cough, the disease continues to remind us that it is neither friendly nor familiar as we so often assume.

Physicians in private practice and public health have carried out an intensive campaign against pertussis in the past decade. Their major weapons have been active immunization with pertussis vaccine and antibiotic therapy of the clinical disease. Vaccine has been given to increasingly greater proportions of the child population since it was first introduced for general use in 1944. The antibiotic therapy of pertussis has been less effective than immunization in eradicating infection with *Haemophilus pertussis* itself (1, 2). However, the control of intercurrent infections has undoubtedly aided in preventing deaths and shortening periods of communicability. These efforts are to be equated with the results obtained from a review of the morbidity and mortality statistics on whooping cough accumulated by the Florida State Board of Health over a period of almost 40 years.

Time Trends in Whooping Cough

The trend of reported whooping cough case rates for the entire history of case reporting in Florida is presented in table 1 and the chart. Whooping cough has been considerably under-reported at all times. Though it is possible that reporting has improved some during the period covered, the extent of any such improve-

ment is unknown. It is certain that the case rates understate the magnitude of the pertussis problem, but they are undoubtedly a valid indication of the trend of the disease.

Over the years there is considerable fluctuation of the rates, with epidemics occurring at intervals of 4 to 6 years, but 2 distinct almost level trends are distinguishable. One extends from 1918 to 1948, with a mean annual rate of 38.7 per 100,000 population. The other extends from 1948 to 1955, with a mean annual rate of 16.8 or a decline of 56.6 percent. This drop may be the result of treatment of the disease in the early stages with antibiotics, resulting in control without diagnosis and reporting, or it may be related to the introduction and use of pertussis vaccine.

In contrast to the morbidity rates, the death rate from whooping cough shows a declining trend over the entire period from 1918 to 1955 (table 1). The reason for this in view of the unchanging case rate is not apparent. It does not appear to be related through time to the introduction of either new preventive or therapeutic techniques.

Infant Death Rate

Cases and deaths by age for the 5-year period 1951-55 are presented in tables 2 and 3. Of the reported cases with stated age for this period, 17.9 percent were in infants under 1 year of age (table 2). Among the fatalities, 73.5 percent were less than 1 year old (table 3). The deaths that occurred within the first year of

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are, however, fairly evenly distributed by age in months with the exception of the neonatal period when no deaths were recorded.

It has been a general policy in Florida to begin the course of immunizing injections at 3 to 6 months of age. It is of interest to note that 36.7 percent of the deaths occurred in

children under 6 months of age and 18.4 percent in those under 3 months of age.

Although cases and deaths from whooping cough occur in both white and nonwhite persons, there is a definite concentration of the cases among the nonwhites (table 4). Over the 5-year period 1951-55 the rates for non-

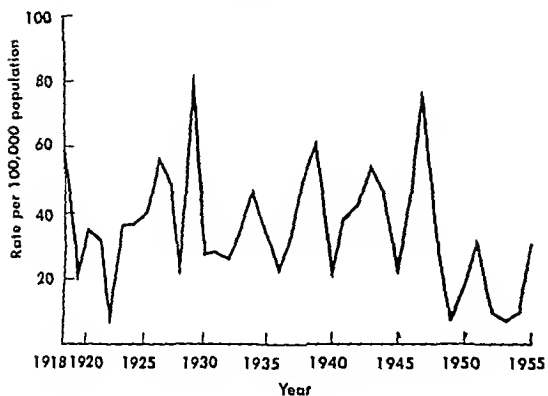
Table 1. Reported cases and deaths from whooping cough, rates, and case fatality ratios, Florida, 1918-55

| Year | Number of cases | Number of deaths | Rates per 100,000 population | | Case fatality ratio ¹ |
|------|-----------------|------------------|------------------------------|--------|----------------------------------|
| | | | Cases | Deaths | |
| 1918 | | | | | |
| 1919 | 557 | 151 | | | |
| 1920 | 203 | 51 | 59.6 | 16.1 | 27.1 |
| 1921 | 347 | 64 | 21.2 | 5.3 | 25.1 |
| 1922 | 333 | 68 | 34.9 | 6.4 | 18.4 |
| 1923 | 94 | 30 | 32.0 | 6.5 | 20.1 |
| 1924 | 410 | 71 | 8.6 | 3.1 | 31.9 |
| 1925 | 444 | 111 | 36.0 | 6.2 | 17.3 |
| 1926 | 493 | 60 | 37.4 | 9.3 | 25.0 |
| 1927 | 748 | 55 | 39.9 | 5.3 | 13.4 |
| 1928 | 654 | 67 | 58.2 | 4.3 | 7.4 |
| 1929 | 321 | 43 | 49.0 | 5.0 | 10.2 |
| 1930 | 1,171 | 86 | 23.2 | 3.1 | 13.4 |
| 1931 | 398 | 56 | 81.8 | 6.0 | 7.3 |
| 1932 | 420 | 25 | 26.9 | 3.8 | 14.1 |
| 1933 | 373 | 31 | 27.9 | 1.7 | 4.9 |
| 1934 | 508 | 44 | 24.8 | 2.0 | 8.2 |
| 1935 | 723 | 109 | 32.7 | 2.8 | 8.7 |
| 1936 | 532 | 59 | 45.6 | 6.9 | 15.1 |
| 1937 | 373 | 25 | 32.8 | 3.6 | 11.1 |
| 1938 | 540 | 58 | 22.2 | 1.5 | 6.7 |
| 1939 | 876 | 68 | 31.1 | 3.3 | 10.7 |
| 1940 | 1,124 | 60 | 48.9 | 3.8 | 7.8 |
| 1941 | 383 | 39 | 60.6 | 3.2 | 5.3 |
| 1942 | 747 | 36 | 20.0 | 2.0 | 10.2 |
| 1943 | 828 | 47 | 37.6 | 1.8 | 4.8 |
| 1944 | 1,134 | 72 | 40.3 | 2.3 | 5.7 |
| 1945 | 981 | 48 | 53.3 | 3.4 | 6.3 |
| 1946 | 477 | 29 | 44.7 | 2.2 | 4.9 |
| 1947 | 1,029 | 12 | 21.0 | 1.3 | 6.1 |
| 1948 | 1,861 | 30 | 43.3 | .5 | 1.2 |
| 1949 | 731 | 21 | 74.9 | 1.2 | 1.6 |
| 1950 | 191 | 6 | 28.2 | .8 | 2.9 |
| 1951 | 471 | 8 | 7.1 | .2 | 3.1 |
| 1952 | 920 | 27 | 16.8 | .3 | 1.7 |
| 1953 | 291 | 5 | 31.7 | .9 | 2.9 |
| 1954 | 209 | 4 | 9.7 | .2 | 1.7 |
| 1955 | 339 | 1 | 6.7 | .1 | 1.9 |
| | 1,080 | 12 | 9.7 | (2) | .3 |
| | | | 29.6 | .3 | 1.1 |

¹ Deaths per 100 cases.

² Rate less than 0.1.

Reported case rates of whooping cough, Florida, 1918-55



white persons averaged 22.3 compared with 17.0 for white persons. The mortality rate for non-whites was 1.2 per 100,000 compared with 0.1 for whites, or 12 times as great. This difference is statistically significant at the 5 percent level.

The Epidemic Year 1955

In 1955, Florida experienced a sharp rise in the incidence of whooping cough (see chart). This increase was not wholly unexpected since, as has been previously noted, such peaks of incidence have tended to occur at intervals of 4 to 6 years. Nevertheless, a special surveillance of whooping cough cases and deaths was carried out to discover if the rise was due to true whooping cough and to elicit information which might aid in the prevention of future epidemics.

An epidemiological investigation was attempted for each of the 13 deaths occurring in 1955 and reported as due to whooping cough. Final evaluation of the information obtained

verified that 9 of these deaths were due to whooping cough; 1 was definitely not whooping cough; and in the remaining 3 the information was insufficient to warrant any conclusions.

Of the 12 definite or probable whooping cough deaths, 11 were in Negroes and 1 in a white child. Eight were under 1 year of age, and 6 of these were 6 months of age or younger. There was a disturbingly consistent clinical pattern in the nine cases with reasonably complete information. The usual onset was insidious and did not arouse the concern of parents or physician, if the latter was consulted. There followed 2 or 3 weeks of progressively more severe coughing, accompanied by unsuccessful attempts to treat with home remedies or refills of original prescriptions. Characteristic, severe paroxysmal coughing with exsufflation of air and inspiratory whoop was often not present until the final week of the illness. The child usually appeared for medical attention either in extremis or with irreversible damage from anoxia and dehydration. Of the 5 patients taken to hospitals, 4 died within 48 hours of admission, and 1 died en route. In only 3 of the patients were X-rays taken; 3 had routine blood counts at some time during their illness, and in none were cultures of the nose and throat obtained.

The equivocal beneficial effect of antibiotic therapy of pertussis was emphasized by the list of seven antibiotics received by these children as a group. In only one child was pertussis hyperimmune serum used for therapy. It would be inaccurate, however, to describe these as treatment failures, since in no case did the physician have the opportunity to institute

Table 2. Reported cases of whooping cough, by age in years, Florida, 1951-55

| Year | All ages | Under 1 | 1 | 2 | 3 | 4 | 5-9 | 10 and over | Age not stated |
|---------------------------------|----------|---------|------|------|------|------|------|-------------|----------------|
| 1951.. | 920 | 137 | 79 | 92 | 96 | 74 | 335 | 85 | 22 |
| 1952.. | 291 | 52 | 33 | 33 | 39 | 22 | 76 | 24 | 12 |
| 1953.. | 209 | 11 | 32 | 25 | 17 | 8 | 66 | 16 | 1 |
| 1954.. | 339 | 56 | 29 | 11 | 34 | 29 | 99 | 21 | 27 |
| 1955.. | 1,080 | 201 | 127 | 103 | 88 | 81 | 292 | 131 | 54 |
| Total.. | 2,839 | 487 | 300 | 294 | 274 | 217 | 868 | 280 | 119 |
| Cumulative percent ¹ | 100.0 | 17.9 | 28.9 | 39.7 | 49.8 | 57.8 | 89.7 | 100.0 | |

¹ Unknown ages excluded.

Table 3. Deaths from whooping cough, by age, Florida residents, 1951-55

| Year | All ages | Under 28 days | 28-59 days | Months | | | | | | | | | | Over 1 year |
|----------------------|-------------|---------------------|---------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|
| | | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| 1951----- | 27 | ----- | 4 | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 1 | ----- | 7 |
| 1952----- | 5 | ----- | ----- | 1 | ----- | 1 | ----- | 1 | ----- | ----- | ----- | 1 | ----- | 1 |
| 1953----- | 4 | ----- | ----- | ----- | 1 | ----- | ----- | ----- | ----- | 1 | ----- | 1 | ----- | 1 |
| 1954----- | 1 | ----- | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1955----- | 12 | ----- | 1 | 1 | 1 | ----- | 1 | 2 | ----- | ----- | ----- | 2 | ----- | 4 |
| Total----- | 49 | ----- | 5 | 4 | 4 | 2 | 3 | 4 | 3 | 3 | 3 | 5 | ----- | 13 |
| Cumulative percent-- | 100.0 | 0 | 10.2 | 18.4 | 26.5 | 30.6 | 36.7 | 44.9 | 51.0 | 57.1 | 63.3 | 73.5 | 73.5 | 100.0 |

Table 4. Reported cases and deaths from whooping cough and rates, by race,¹ Florida, 1951-55

| Year | Number of cases | | Number of deaths | | Rate per 100,000 | | | |
|--------------|-----------------|----------|------------------|----------|------------------|----------|------------------|----------|
| | White | Nonwhite | White | Nonwhite | Cases | | Deaths | |
| | | | | | White | Nonwhite | White | Nonwhite |
| 1951----- | 663 | 244 | 6 | 21 | 29.0 | 39.5 | 0.3 | 3.4 |
| 1952----- | 158 | 129 | 1 | 4 | 6.6 | 20.5 | (²) | .6 |
| 1953----- | 153 | 54 | 1 | 3 | 6.2 | 8.5 | (²) | .5 |
| 1954----- | 289 | 44 | 1 | ----- | 10.3 | 6.4 | (²) | ----- |
| 1955----- | 839 | 239 | 1 | 11 | 28.7 | 33.0 | (²) | 1.5 |
| Average----- | 420 | 142 | 2 | 8 | 17.0 | 22.3 | 0.1 | 1.2 |

¹ Cases with race unknown are excluded.

² Rate less than 0.1.

treatment after diagnosis in the early stages of the disease.

Typical case histories, supplied by Dr. James Stem, Dr. B. M. McKlosky, and Dr. Felix Balmir, follow:

CASE 1: N. W., a 16-month-old white female infant, was 1 of 6 siblings. The public health nurse had been in frequent contact with the family, but their religious beliefs had prevented immunization. Twenty-three days prior to death, the child developed a mild upper respiratory disease. Although typical cases of whooping cough were present in the older siblings, medical attention for the child was not obtained until 3 days prior to death. Severe paroxysm with typical whoop had been present for 5 days, and on the day of admission to the hospital, the child had been in a continuous convulsion for 4 hours with a temperature of 105° F. The total white cell count on admission was 21,000 with 71 percent lymphocytes. The hemoglobin was 11.8 grams. Despite administration of chloramphenicol and penicillin intramuscularly, adrenal cortical ex-

tract intravenously, continuous oxygen, and standard anticonvulsant therapy, the child remained comatose and died on the second day in the hospital.

CASE 2: E. C., a 1-month-old Negro female infant, became ill 14 days before death. Two other siblings in the home were apparently well. The mother did not recall having had whooping cough in her childhood. The initial symptoms were infrequent spells of coughing associated with collection of mucus. On the 3d and 10th day of the illness, a physician saw the child and prescribed Achromycin (tetracycline). Four days before death, the coughing became paroxysmal. The child became febrile and developed respiratory distress. While nursing on the final day of life, the child was seized by a paroxysm of coughing and died.

CASE 3: E. M. C., a 10-month-old Negro female infant, had onset of a mild respiratory illness 14 days before death. No family or neighborhood contact had whooping cough. At age 5 months she had visited the local health department clinic for immunization, but the parents were told to return her

at 6 months of age for her initial immunization. In the second week of her illness she developed typical coughing with inspiratory whoop, having 12 to 20 paroxysms per day. These were said to be accompanied frequently by convulsive episodes. On the 13th day of her illness, she was admitted to the hospital. Temperature on admission was 105° F. The white cell blood count was 22,850 with 67 percent lymphocytes. A chest X-ray revealed findings consistent with a diagnosis of interstitial pneumonia. She received intramuscular penicillin, streptomycin, and 2.5 cc. of pertussis hyperimmune serum. Despite heroic therapeutic measures, she died on the second day in the hospital.

Discussion

The first case represents the frustration of the best of medical and public health facilities by the lack of intelligent interest on the part of parents. The second case presents a typical problem in diagnosing a small infant. Pneumonia, perhaps due to aspiration, was the initial diagnostic impression, but in retrospect an underlying infection with *H. pertussis* was considered the most likely cause of death. It is a moot question whether, if this were the actual cause and it had been diagnosed, treatment would have altered the outcome of the case. Case 3 illustrates the need for beginning pertussis immunization at an earlier age than 6 months. In only 2 of the 12 cases was there a record of any prior pertussis immunization, and these were single diphtheria-pertussis-tetanus injections. In one case the health department notice reminding the parents of the need for immunization arrived the day after the death of the child. In two instances the parents refused immunization, in one they were unaware of the need, and in four cases immunization was deferred until the infant reached an older age.

It is generally agreed that immunization is the major weapon against whooping cough, and it would appear that in Florida it needs more vigorous use. The cyclical occurrence of the disease indicates a periodic buildup of susceptibles due to new births, although immigration cannot be ignored as a possible contributory factor in Florida. Particular interest needs to be centered on giving complete immunization to the group of children under 6 months of

age. The American Academy of Pediatrics (3) recommends beginning pertussis immunization whether alone or in combination with diphtheria and tetanus between the second and fourth months of life. It has been shown that infants of this age are capable of producing agglutination antibodies against pertussis, although the response is quantitatively not as good as that against diphtheria and tetanus toxoids (4, 5).

There is a need in Florida for extending the immunization of Negro infants, a challenge of particular urgency for public health physicians. Private physicians should continue to stress the importance of immunizations as a part of the routine of infant care. It would appear important also to consider possible whooping cough in all protracted upper respiratory illnesses of infants with or without the typical inspiratory whoop. Parent education on the importance of routine medical attention for young infants is the job of all who are concerned about the future health and welfare of our children.

Conclusions and Summary

Whooping cough remains a major cause of death in infants in the communicable disease category. In Florida a reduction of the case rate by 56 percent during the period 1948-55 would seem to be related in time to the introduction and use of pertussis vaccine and antibiotic therapy. Modesty is appropriate, however, in assessing these therapeutic efforts since the steadily declining mortality rates are unrelated in time to specific preventive or therapeutic measures.

The epidemic year 1955 is ascribed to inadequate immunization of young children, particularly those under 6 months of age.

Routine pertussis immunization of infants beginning at the second month of life is necessary for complete control of this disease.

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publications

Special Health Services

PHS Publication No. 530. 1957. 19 pages; illustrated.

Activities concerned with accident prevention, air pollution, chronic disease, the aged, heart disease, occupational health, radiations, and tuberculosis are described in popular language, with glimpses of the work of the Division of Special Health Services of the Bureau of State Services, Public Health Service.

Tuberculosis Chart Series 1957

PHS Publication No. 534. 1957. 45 pages; charts.

This edition charts comprehensively the statistical aspects of the tuberculosis problem in the United States. The facts and figures, derived from many authoritative sources, cover a wide range of problems and challenges and are designed to provide a sound basis for program planning. Some of the subjects included are: estimated prevalence of cases; major types of expenditures, 1952 and 1956; newly reported cases and deaths, 1930-56; age-specific rates for newly reported active cases and deaths, 1955; race and sex of fatalities and newly reported active cases, 1955; and newly reported active cases per 100,000 population, United States and Territories, 1956.

Many of the charts, published formerly in the chart series, are reprinted because of their continuing pertinency and interest. Additional charts will be published in subsequent editions as new problems arise and changing trends demand.

Proceedings, 1956 Annual Conferences

Surgeon General, Public Health Service, and Chief, Children's Bureau with State and Territorial health officials

PHS Publication No. 522. 1957. 54 pages.

The proceedings contain the deliberations of the 1956 conferences of the Surgeon General with State and Territorial health officials, hospital and medical facilities survey and construction authorities, and mental health authorities. Addresses made to each of these groups are part of the publication.

Recommendations and resolutions of the participating State and Territorial officials reflect the attention given to such subjects as chronic illness and aging and standards for hospital and nursing home care; reporting of vital records and statistical data; accidents, labeling laws and regulations, and poison information centers; civil defense, radiological defense, and other emergency measures; curriculums for professional schools, training of dental

and other public health personnel, and training of mental health personnel for community services; water and air pollution, Indian health, migratory labor, and other public health problems.

VD Fact Sheet

PHS Publication No. 341. Issue No. 13. 1956. 22 pages; tables.

Intended as a ready source of basic statistics on the venereal diseases in the United States, this publication presents data on trends in venereal disease incidence and prevalence. Other statistics relate to the estimated annual costs of uncontrolled syphilis, mortality and insanity due to syphilis, reported cases of venereal diseases, case-finding activities, morbidity by age, congenital syphilis, and use of penicillin in treatment of syphilis.

The information, current as of December 1956, supersedes previously published data.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Three Phase Sanitation Program in the Klamath Flood Disaster

JOE CREISLER, M.P.H., R.S.

OF the many activities carried on by the sanitation staff of a health jurisdiction, none can so strain the personnel, facilities, and general program as that required by a major disaster. Beginning in December 1955, the Humboldt-Del Norte County Health Department dealt with the special sanitation problems left by the flood of the lower Klamath River in Del Norte County, Calif. The sanitation program following the disaster operated in three phases: emergency, removal of flood debris, and rehabilitation. The objectives were to prevent the outbreak of any major epidemic, to protect the public health and safety, and to return the affected areas to normal as soon as possible.

The flood disaster occurred at the mouth of the Klamath River where the communities of Klamath, Terwer Valley, and Klamath Glen are located on the extreme flood plain. There the runoff of a watershed comprising more than 15,500 square miles empties into the Pacific Ocean.

The lower Klamath River was subject to the greatest flooding in the history of its recorded stream flow during the week preceding Christmas of 1955. The previous record peak flow at Klamath was 297,000 second-feet with a gauge height reading of 43.7 feet in January 1953. On December 22, 1955, the peak flow at Klamath was 400,000 second-feet with a gauge height of 49.7 feet (1). From December 19 to 25, the total volume of flow past the town of Klamath was 2,500,000 acre-feet.

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The Del Norte County Civil Defense Office later reported that 700 families, or about 2,450 persons, had to abandon their homes for the first 24 hours following the flood peak (2). In the town of Klamath, 312 structures were destroyed or damaged; 212 were individual homes. In the Klamath Glen and Terwer Valley areas, more than 47 residences were lost or damaged. The flood caused an estimated damage of more than \$3,500,000 to an area along the lower Klamath River covering approximately 8 square miles.

As the flood waters receded, the full extent of damage to sanitation and the corresponding threat to public health and safety began to emerge. The contaminated and silt-laden flood waters had swept foodstuffs, furniture, clothing, and parts of buildings into mountains of debris, clogging the streets and commercial establishments. Buildings were knocked off their foundations; some were ripped up and deposited on the roads. Collected in gaping holes, themselves a threat to public safety, were sewage effluent, organic wastes, and other debris. The community water systems in the area were crippled. Sewage disposal was brought to a virtual standstill. Natural drainage courses for the runoff of normal surface water were altered by heavy deposits of silt.

The Emergency

During the acute emergency, the sanitation staff of the bi-county health department worked under the direction of the civil defense medical officer for Del Norte County. When communications were again functioning between the disaster area and headquarters of the health de-

partment, the department undertook joint jurisdiction with the civil defense medical officer of emergency sanitation.

The first job was to check and supervise mass feeding centers, water supply points, food distribution centers, and general emergency sanitary facilities. City water and a sewer system were available to the mass care center in Crescent City. The other centers, which were close to Klamath and the flooded area, had to depend on individual wells and septic tanks for water and for sewage disposal. We maintained constant surveillance of the water used at these centers by frequent checks and sampling. Despite overcrowded and strained facilities, however, sanitation was maintained at a high level in the mass care centers, and no major epidemic occurred.

After the flood waters receded, the town of Klamath, which had suffered the worst flooding, was placed under quarantine in an attempt to prevent looting and distribution of contaminated foodstuffs. The three lower Klamath River communities were surveyed to ascertain the extent of damage and the needs of the devastated area.

The most obvious need was for removal of the huge piles and pockets of debris. It was equally obvious that emergency organization and outside aid would be required simply to remove the superficial debris from the area.

The postflood survey drew attention to the special problem presented by the gaping holes which pitted the ground in Klamath, Terwer Valley, and Klamath Glen. Some of these holes predated the flood, but many had been made by it. They ranged from 2 to 20 feet in depth and from 10 to 200 feet in length. Because of their depth, location, or contents, we recommended that they be filled.

The only means of sewage disposal in the lower Klamath River area is by individual septic tank or cesspool. Before the flood, existing facilities were known to be seriously substandard. A survey of the town of Klamath in June 1954 showed that of more than 121 systems found, only 13 percent were up to California public health standards (3); 38 percent were barely passable; and 49 percent were below standard and constituted a hazard to the

public health. Other parts of the lower Klamath River area presented the same conditions to a lesser degree.

As a result of the flood, nearly all the individual sewage disposal systems in the town of Klamath and its immediate surroundings were ruptured, silted-in, or otherwise made inoperative. The Terwer Valley area suffered some sewage disposal trouble, and the systems in Klamath Glen were completely destroyed.

Chemical toilets were stationed throughout the affected areas for use until the septic tanks could be cleaned out and restored. By contract terms arranged through civil defense authorities, a private sanitation company supplied and maintained the toilets under health department supervision. Experience in this and an earlier flood (January 1953) has convinced the health department that chemical toilets, maintained by a private concern and supervised by department sanitation staff, are the best means of emergency sewage disposal in a disaster. We found construction of sanitary privies impracticable because of the maintenance required.

Provision of safe and potable water during the emergency was not a big problem. Fortunately, a number of watering points—wells and springs—in and near the disaster area were untouched by the flood waters. People were cautioned to boil or otherwise disinfect all water, and a program of testing and decontaminating individual wells was begun. We investigated and sampled all watering points which could be drawn upon as sources of public supply. At first people brought their own containers to the approved sources. Later on water was distributed by the local fire district's pump truck. Plans were made to send drinking water around to workers in the cleanup program via the Red Cross canteen truck and the Salvation Army mobile mess unit. There was enough safe, potable water to fill all individual and domestic needs without rationing.

Removal of Flood Debris

By authorizing the bi-county health department to supervise a program of flood debris removal and rehabilitation, the board of supervisors of Del Norte County officially recognized the county's responsibility for these postflood



Courtesy Del Norte TriPLICATE

Flood peak in Klamath on December 22, 1955.

activities. Funds for the program were made available to the county through Federal grants under Public Law 875 (81st Cong.), as a disaster relief measure. The sum of \$103,600 of Federal funds was budgeted for the removal of flood debris, destruction of unsafe buildings, emergency garbage disposal, and other contingencies affecting public health and safety. Additional amounts of \$75,576 for the filling of the holes and \$1,000 for the cleaning of septic tanks were granted under Public Law 875.

Flood debris removal began on December 27, 1955, with the signing up and hiring of the cleanup and heavy equipment crews which were already at work in the area. All labor and equipment used for 3 days after the flood had been donated to the program.

Three working crews, each with a foreman, were organized to do general cleanup work, op-

erate heavy equipment, and provide emergency garbage and rubbish collection. Two crews, one operating heavy equipment and one collecting garbage and rubbish, worked in and around the town of Klamath. A third crew performed all three functions in the Terwer Valley and Klamath Glen areas.

One great asset to the cleanup program was the availability of heavy equipment and operators from the local lumber mills and logging operations in the Klamath region. More than 20 pieces of equipment were used daily in the first 2 weeks; a smaller number sufficed for the remainder of the program. This equipment consisted of dump trucks, tractors and carryalls, a pickup crane, loaders, tow trucks, pickup trucks, and logging trucks. The machines were used to move buildings off the roads, remove debris, collect garbage, and salvage property.

Payment was on a force-account basis with the equipment and its operation rented at established rates per hour.

In the town of Klamath, flood debris removal was first concentrated in the commercial section. Cleanup crews were at once put to work removing debris, rubbish, and flood-damaged foodstuffs from the restaurants, grocery stores, and taverns. Immediate attention to the food and drinking establishments was necessary to forestall a serious garbage problem, the illegal distribution of flood-damaged foodstuffs, and to prevent an infestation of rodents and insects.

Nonfood commercial establishments were then cleared of contaminated debris. We ordered that every business establishment where the public could encounter risk be cleaned. At the same time, the emergency garbage and rubbish collection crew was hauling garbage and flood debris to the public dump. Except in a few cases, private residences were cleaned by their owners. All possible speed was urged in this program, for we felt that only with rapid removal of the debris could an area where sanitation was so poor escape the outbreak of an epidemic.

The cleanup program included the destruction of flood-damaged buildings in and near the town of Klamath. Of the 68 parcels of occupied land in Klamath, structures on 18 had been wiped out by the flood. Under the cleanup program, damaged structures on 9 parcels were removed with the owner's written consent, and 1 or 2 damaged housing units were removed from 3 parcels of land on which other housing units remained intact.

In the second stage of the program the working crews were employed in a wooded area adjacent to and down river from the town of Klamath where flood debris of all kinds had drifted and lodged. To forestall a serious infestation of rodents and insects and to prevent use of damaged building material for possible substandard housing, the area was cleared and burned.

The cleanup effort began in the Terwer Valley and Klamath Glen areas after some delay due partly to a shortage of manpower and partly to the absence of many individual property owners who had been driven from their homes by the flood. However, no rubbish or flood

debris was removed from individual property until the owner was able to salvage what he could. Dead animals, a serious problem in this area, were buried in one of the flood-made holes.

The health department also supervised the cleaning of those septic tanks and cesspools which had been so affected by the flood as to endanger public health. This project cost about \$900 more than the \$1,000 budgeted for it, but more than 234 loads were pumped from 51 individual systems by a special contract made with a local septic tank cleaning firm. Under this contract the local firm was paid \$7.50 per load pumped, and the county paid for the gas and oil used. The usual cost per load of septic tank pumping is \$17.50 for the Klamath area.

Rehabilitation

Rehabilitation following the disaster included the filling of holes; the correction of the acute drainage problem caused by the flood; restoration of the community water system in Terwer Valley and the attempt to rehabilitate the water system in Klamath; the supervision of the rebuilding of sanitary facilities; and the emergency housing program.

Filling the holes became the most controversial project of the entire postflood program. After the county board of supervisors ordered that the holes designated by the health department be filled, the California State Office of Civil Defense was to award the work contract to the State Division of Highways. However, the board of supervisors was informed that this job would be a county responsibility. In order to expedite the request for funds under Public Law 875 and prepare the necessary paperwork for the task, a cursory survey was made of the holes in the town of Klamath only, and estimates were obtained as to the amount of fill needed and the cost of the material. The job of filling the holes in the town of Klamath was given to a local contractor (without bids) at the rate of \$0.95 per cubic yard, for 51,000 cubic yards of fill.

Immediately after the hole-filling project was started, two protests were made: first, that the fill material was too costly; second, that this program would raise the value of some private property above its preflood worth. The



Flood-made hole and projecting sidewalk where house once stood in Klamath.

health department advised the board of supervisors that the holes had to be filled because of the extreme hazard they presented, whether or not they had been there before the flood. The department's position was supported by the chief of the bureau of sanitary engineering of the State health department and by the director of civil defense of Los Angeles County on loan to Del Norte County. In order to eliminate the hazard as soon as possible, the board of supervisors awarded the contract and disregarded the property improvement argument.

More than 41 parcels of land in the urban sections of the disaster area were filled. In the town of Klamath, 5 major holes covering 19 parcels of property occupied before the flood were filled under the contract. Three other holes in Klamath, 8 parcels of land in Terwer Valley, and 12 parcels of land in the Klamath Glen area were filled using the force-account arrangement.

The silting in of natural drainage courses

by the flood had changed and blocked surface water drainage in the vicinity of the town of Klamath. This condition caused local flooding covering several blocks in the town and affected the rehabilitation of those individual sewage disposal systems which still existed after the flood. Heavy equipment was used to fill minor depressions, level off irregular ground, and open up new drainage channels. The county road department helped with the problem.

Efforts to rehabilitate the area's two community water systems—one in the town of Klamath and the other in Terwer Valley—received support and technical assistance from the State health department. Restoration of the Terwer Valley system was accomplished right after the flood with minor repairs to the distribution lines and decontamination of the well supply. On the other hand, trying to get the Klamath water system rehabilitated was the most frustrating task on the postdisaster program.

Before the flood, equipment, operation, and maintenance by the private water company serving Klamath were below standard for a community water system. The system was severely damaged by the flood, and yet, despite constant urging by State and local agencies, no major repairs were undertaken by the company until after May 1956. That was 5 months after the flood.

But as soon as the cleanup program began in late December 1955, we needed water under pressure for washing down the commercial establishments and houses that were encrusted with flood-deposited silt. After the main lines were patched up, the Klamath water system was able to furnish water for cleanup activities such as "wash down."

The water could not be declared safe for domestic use, however. There were major leaks which could allow surface water to backflow into the system, and there were broken mains.

In circumstances like these, disinfecting the water provides some measure of safety. An emergency hypochlorinator was borrowed from the State office of civil defense, installed in the system, and turned over to the water company for operation. As it turned out, the hypochlorinator was used off and on for a while, and then it lay idle even though both State and local health personnel continued to urge its use.

The sanitation staff could not take over maintenance of the hypochlorinator, for we had neither time of our own to spare nor another qualified man available. From this experience we learned a very important lesson in disaster sanitation: emergency civil defense equipment, no matter how modern nor how needed, is useless if trained personnel are not on hand to use it properly.

In the case of the Klamath water system, the health department was caught in a dilemma. The purity of the water being supplied by the water company was questionable; the department had no legal power to insist that the company use the emergency disinfecting equipment or else undertake rehabilitation immediately; and the water was needed for important cleanup activities.

A backward look at the various postflood water problems shows that the sanitation staff



Courtesy Harris Studio

A flood-damaged building is burned in the cleanup program.

was able to handle emergency needs and problems of simple reconstruction. We failed to bring about the major rehabilitation of a community water system which its private owners, for financial or other reasons, would not undertake on their own. An important cause for this failure was the absence of any legal authority which would have enabled the county or the State to step in.

The rebuilding of sanitary facilities, buildings, and emergency housing was a joint venture of Del Norte County and the State division of housing. The division of housing performed most of the work under the authority of an emergency county building permit ordinance. The health department inspected emergency housing units (trailers) for general sanitation.

Special Problems

The flood debris removal program presented some special administrative and health problems not anticipated as part of the postdisaster planning. As the disaster relief program progressed, it became apparent that on rigid administrative policies could be set and maintained. Instead a fluid, or command decision.

approach was required of the health department and the county.

One of the main problems was to set up emergency payrolls for the cleanup crews and rental fees for the heavy equipment used. Del Norte County was fortunate in having a county auditor who was able to grasp quickly the financial intricacies of Public Law 875 and to set up the accounting methods and books necessary for the functioning of the program.

The difficulty arose in signing up a fluid working force and hiring heavy transit equipment, both of which were already working in the disaster area, and in organizing an emergency payroll. In the beginning, a bewildered timekeeper listed the name of the worker or the owner of the equipment and the hours spent on cleanup work on slips of paper and hastily bought timebooks. Initially the loose-knit organization and supervision of the crews caused such confusion in timekeeping and the placing of workers that supplemental payrolls were required to set things straight. This situation was remedied when rates of pay and rental fees for equipment were established, crews properly hired and supervised, and social security numbers and withholding tax categories obtained.

A hindsight look at this problem of emergency payrolls for disaster work shows the need for having an emergency payroll and proper administrative procedures set up as part of civil defense planning. We will not soon forget the nightmare, just after the disaster, of organizing a payroll for people dependent upon the paycheck to feed and clothe their families.

A serious health problem arose during the cleanup program concerning the illegal distribution of quarantined foodstuffs. The health department had posted and placed all food establishments and taverns under quarantine immediately after the flood, but adequate manpower was not available for enforcement. Foodstuffs were looted and picked up in the flooded area. Efforts by Federal, State, and local food inspectors to survey for condemnation or release of foodstuffs did little to stop the practice. We faced the same problem at the county dump, which was the designated place for the dumping of flood debris. Although the

dump was posted with warnings against taking condemned foodstuffs, people continued to raid it. In spite of this illegal distribution of foodstuffs, no reported cases of serious food poisoning came to the attention of the health department.

An additional public health hazard came from the contaminated silt which settled throughout the town as an aftermath of the flood. Our first plans were to make silt removal the responsibility of the private property owner. Soon it became apparent that the foul smelling silt, mixed with organic waste material and sewage effluent, was too much for individual owners to cope with; they were only moving the contaminated silt—and the hazard—from one place to another. In order to get it done properly, the county undertook silt removal.

We used heavy equipment to scrape and remove the contaminated silt from private property to the county roads. From there it was picked up by truck and hauled away to be used as fill in the deeper holes being filled as part of the general program. In places where heavy equipment could not be used, the silt was spread out for leaching by the rains or disinfection by sunlight and the use of "hot" lime. These areas were posted with warning signs which read "Warning—Raw Sewage in this Area."

One special assignment to the health department was the disposal of lost property picked up by the cleanup crew. Such property was stored in open depots and the one available warehouse in the Klamath area. The material was then inventoried and the list published in a local paper for a period of 90 days. All the property not claimed at the end of this period was sold for the county under the supervision of the health department. Very little property was claimed, and the expenses of collection, transportation, inventorying, and publishing amounted to about \$400. The amount collected by the county from the sale was about \$70. This was one task we had certainly not anticipated as part of emergency sanitation work.

Analysis

The entire postflood disaster program, which included flood-debris removal, cleaning of septic tanks, filling of holes, and general emergency

sanitation work, covered a period of 16 weeks, December 27, 1955, to April 14, 1956. Most of the flood debris was removed in the first 7 weeks, with an average daily working force of 130 for the first 2 weeks, decreasing to an average daily crew of 24 for the seventh week and the use of 1 or 2 men for the remainder of the period. The hole-filling program was completed in the 16th week after the flood. Because of the extreme urgency for cleaning up the disaster areas and the possibility of losing the labor force with the reopening of local industries, large crews were used except in the Klamath Glen area. In spite of adverse weather, most of the town of Klamath and partial sections of Terwer Valley and Klamath Glen were cleaned up by the seventh week after the flood.

A review of the program shows that the department accomplished the cleanup in what could be considered record time, prevented the possible outbreak of a major epidemic, and improved the environmental sanitation of the disaster area. The county and the health department attempted to return the affected areas

to a state of normalcy, the primary aim of all postdisaster activity. The objectives of the health department were accomplished through the teamwork of Federal, State, and county government officials on the one hand and the citizens on the other.

The long-range rehabilitation problems of proper sewage disposal, adequate and safe water supply, and some measure of flood control face the people of the Klamath area. The health department, in conjunction with other county agencies, has been delegated to help work on these problems. Through continued cooperation and teamwork between county, State, and Federal agencies, in time full rehabilitation can be effected.

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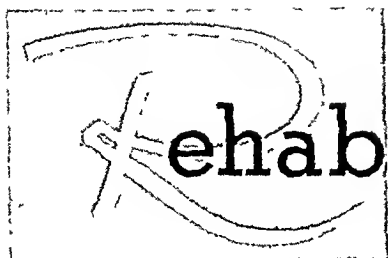
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Biology of Water Supplies

Three training courses in water pollution control are scheduled by the Robert A. Taft Sanitary Engineering Center for the fall of 1957. Training in the biology of polluted waters is offered October 7 to 11; the bioassay of toxic wastes, October 14 and 15; and advanced training in detection and control of algae and other interference organisms, November 4 to 8.

Courses are open to personnel in industry, in State, county, and municipal health departments, in water supply and pollution agencies, colleges, universities, and research organizations.

Address requests for further information to the Robert A. Taft Sanitary Engineering Center, Public Health Service, 4676 Columbia Parkway, Cincinnati 26, Ohio.



Rehabilitation

WITH the cooperation of Miss Mary E. Switzer, director of the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, *Public Health Reports* has obtained a number of contributions relating rehabilitation work to public health. We hope these papers will assist health agencies in creating or restoring in many crippled, bedridden, or otherwise handicapped patients a greater degree of self-reliance and usefulness.

Rehabilitation services are at every point a logical expression of a positive philosophy of public health, seeking not merely to prevent or attend disaster but to create a state of well-being.

With respect to certain categories of disability, our contributors were asked to set down information which might improve comprehension of rehabilitation opportunities. They have endeavored in most of these papers to describe the nature of the disability, remedial potentials, methods, typical complications, and reasonable goals. Since more papers were offered than could be scheduled in one issue of this journal, publication of several has been deferred.

If readers are interested in learning more about case finding, home care, or community facilities for rehabilitation, we shall try to provide such information in future papers.

In addition to completing this roundup of disability categories in rehabilitation, we hope that future contributors will report successful efforts to utilize ordinary health department resources to find and assist candidates for rehabilitation, in cordial cooperation with established welfare services, rehabilitation agencies, and allied community facilities.

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rehabilitation rather than attempt to decide this itself. Incidentally, State rehabilitation agencies have been expanding rapidly during the last few years, the national total of financial support having doubled in 3 years. This expansion has not been uniform throughout the Nation, but in most States the vocational rehabilitation agency is probably better prepared to serve the handicapped than ever before.

Crippled Children's Service

The State crippled children's service is legally responsible for serving handicapped children, as the vocational rehabilitation service is for adults. Crippled children's services are, however, traditionally limited to certain categories of the handicapped, and the degree of coverage varies widely among the States. Children with orthopedic and plastic disabilities are served everywhere. Some States have programs for victims of rheumatic heart disease, cerebral palsy, and other disabling conditions. Crippled children's services are usually administered in State departments of public health, although in some States, departments of education and departments of public welfare are in control. Incidentally, the fact that the crippled children's service is administered by the public health department does not necessarily mean that public health employees in other divisions of the department have a thorough understanding of its services. Some people know more of what is going on in the next State than they do of what is going on in the next office.

In most of the States, crippled children's services are largely medical. Much of the medical service of crippled children's agencies is provided in outpatient diagnostic and treatment clinics. The specialized hospital is also widely used.

There is a growing tendency to provide educational services for crippled children, if they are supplied at all, in the regular public schools, and they are sometimes given by special schools for certain classes of handicapped children. Information about the local program for handicapped children and its coordination with medical services should be available from the school board. Many States now appropriate

funds to help local school districts develop and operate special classes for handicapped children. Your local superintendent of schools will know whether such aid is available in your State.

Assistance and Insurance

Health workers should also be familiar with assistance and insurance programs for handicapped people. Nearly all States have public assistance agencies for the "permanently and totally disabled." Generally, these agencies work closely with vocational rehabilitation agencies. It is realized by everyone that it is far better, both for the handicapped individual and the Nation, that the individual rehabilitate himself than become a permanent recipient of public assistance.

Many handicapped persons have rights under the Federal old-age and survivors insurance program. A person 50 years of age, for instance, who has acquired social security credit for 5 years of work in the 10 years before onset of his disability, and who worked 1½ years in the 3 years before becoming disabled, may receive cash disability benefits if he is so severely disabled that he is unable to engage in any substantial gainful employment. If he is less than 50, he can have his earnings record frozen so that benefits he is entitled to at age 50, or on retirement at age 65, will not be reduced on account of loss of work credit due to his disability. Children, disabled before reaching age 18, of insured parents deceased after 1939 or receiving old-age insurance benefits, are also eligible for cash payments. Application should be made to the local offices of the Bureau of Old-Age and Survivors Insurance. In a vast majority of the States, the actual determination of disability is made by the vocational rehabilitation agency.

In every State employment service office, at least one employee gives special placement services to the handicapped. Unfortunately, these services are not uniformly effective throughout the country. The vocational rehabilitation service to which the handicapped person is referred provides rehabilitation services and works with the employment service when the individual is ready for a job.

A Guide for Referral Agencies

E. B. WHITTEN

IN a certain county, not too long ago, a State rehabilitation supervisor was describing the services of his office to a public health worker, who interrupted to say, "This is wonderful. When are you going to begin the program in this county?" The counselor, who had served this part of the State for several years, was naturally disconcerted that his program was so little known. The public health worker should have been equally embarrassed that she did not know about this source of help for handicapped people.

My own experience has taught me that one can never take for granted that others understand the uses they may make of his program. Full understanding does not come about until workers of different agencies have actually worked together in providing services. There seems to be no effective substitute for learning by doing.

Vocational Rehabilitation Service

Rehabilitation agencies have legal responsibility for providing rehabilitation services to adults with physical or mental disabilities that handicap employment. Every State has a vocational rehabilitation service; in most instances, it is administered by the State board of vocational education or the State department of education. Exceptions are Massachusetts, South Carolina, New Jersey, and the District of Columbia, where independent rehabilitation agencies have been established. It should be noted that rehabilitation programs for the blind

are more often administered in State departments of public welfare or independent commissions for the blind. Vocational rehabilitation offices are found in all principal cities, and itinerant services are sometimes available in other areas.

Rehabilitation services in these agencies include diagnostic services (medical, social, psychological); medical treatment, including surgery, hospitalization, and medically supervised therapy; prosthesis; vocational training; placement services, including occupational tools and equipment; and job adjustment services. Maintenance may also be provided to assure the availability of other services. A means test is required for all except diagnostic services, counseling and guidance, vocational training, and placement. This test is generally much more liberal than that applied by State agencies to determine eligibility for public assistance.

Referral agencies should direct all handicapped adults to the vocational rehabilitation service, unless they are clearly ineligible. Rehabilitation agencies serve individuals with all types of disabilities and are in position to purchase the very best diagnostic and treatment services available. The personnel of these agencies are intimately acquainted with all community resources that can be mobilized to help handicapped people solve their problems.

Limitations may be encountered. Vocational rehabilitation agencies can accept only those handicapped for whom there is a "reasonable expectation of remunerative employment," and only those individuals that are of, or near, work age. The referral agency should allow the rehabilitation agency to determine whether a particular individual can be given vocational

Mr. Whitten is executive director of the National Rehabilitation Association, Washington, D. C.

Community Plan for Epileptics

FRANK RISCH, Ph.D., and AUGUSTUS S. ROSE, M.D.

THE PROBLEMS in rehabilitation of persons with epilepsy differ in many respects from those encountered in dealing with physical handicaps of other types. For one thing, there is lack of unanimity within the medical profession concerning definition and diagnosis of the condition. For another, the public is considerably confused by much misinformation and little correct information. Despite present-day knowledge about epilepsy and the availability of good medical treatment, many people still think of the affliction as a "taint" and believe it to be associated with insanity.

Epilepsy, a condition in which there are recurrent episodes of disturbance in consciousness, varies in form and severity. Some spells are only momentary lapses, while others are severe generalized convulsions. The spells may be simple automatic movements or peculiar actions associated with unresponsiveness and a complete lack of memory. The seizures are manifestations of a brief disturbance in functioning of the brain, which very often is the result of an old, forgotten or unknown injury. One of the peculiarities of the handicap produced by epilepsy is that the person may be entirely normal in appearance, manner, and intellectual ability between seizures. The suddenness with which the attack comes and helplessness felt by those nearby add to the mystery of the condition.

Dr. Risch is chief of the epilepsy rehabilitation service, Veterans Administration Center, and project director for Epi-Hab L.A. Inc., Los Angeles, Calif. Dr. Rose is professor of medicine (neurology) and head of the department of neurology, University of California at Los Angeles School of Medicine, and treasurer of Epi-Hab L.A. Inc.

School authorities, employers, and fellow workers generally do not like to have an epileptic around. Children with epilepsy are commonly sent home from school after an attack, and frequently they are excluded from regular public school classes altogether. Ostracism and family feelings of shame, which may be present, make a bad situation worse. The young person who has a seizure while at work may lose the job, and a long hard road of having to lie about his condition is begun if any work at all is to be had. Capacity to work is not the measure. The adult who has supported his family finds after developing epilepsy that life can be very grim. Discrimination and enforced dependence lead to lack of confidence and often to increased difficulty in controlling the seizures.

Because of the large number of persons with epilepsy—it is estimated that there are now about one and one-half million in the United States—the Veterans Administration in 1949 appointed a medical committee to survey the problem among veterans in the Los Angeles area. This survey revealed that 75 percent of the veterans with epilepsy living in the community were unemployed and that a large percentage of this group were also under poor medical control. A number of veterans with epilepsy were in the hospital, and experience has shown that once in the hospital, epileptic patients tend to remain under the care of the Veterans Administration indefinitely.

In 1950 the Veterans Administration began a pilot study in employment of domiciled epileptic veterans. This study, in the form of an experimental workshop, was designed to determine the beneficial effects of steady, gainful employment on control of seizures, and to pro-

Other Facilities

In almost every medium-sized or large city additional facilities and services are available to handicapped persons. These are as varied as the communities themselves and are likely to be products of voluntary effort. They may be sponsored by local units of national health agencies such as the National Society for Crippled Children and Adults and the American Hearing Society, or they may be independent, nonprofit, community undertakings. Prominent among such facilities, and rapidly increasing in numbers, are rehabilitation centers and sheltered workshops.

Fortunate is the community that has a well-organized and effective rehabilitation center and sheltered workshop facilities. The rehabilitation center attempts to bring together the skills of professional rehabilitation workers for their effective application. It may be a comprehensive facility, offering medical, psycholog-

ical, social, and vocational services, or it may offer a narrower range of services. The physician, the counselor, the social worker, and therapists usually form the nucleus of this rehabilitation effort, which may be operated on an outpatient or inpatient basis, or both.

The sheltered workshop provides available employment opportunities for handicapped people who cannot fit into competitive employment or who cannot find jobs commensurate with their abilities. It may also provide a transitory adjustment service as a steppingstone to competitive employment. The current tendency is toward emphasis on transitional experience.

To a public health worker who wants to assist the handicapped, there is probably no better advice than "know your community." If he undertakes systematically to become acquainted with the rehabilitation programs of the community, he will feel rewarded for the experience.

New Treatment for Aged Disabled Veterans

A rehabilitation program has been developed by the Veterans Administration for aged disabled veterans. Many of the treated patients, including victims of strokes, hardening of the arteries, and multiple sclerosis, might otherwise be destined to spend the remainder of their lives in hospitals. Prior to treatment, some were not able to leave their beds unaided or propel themselves in wheelchairs. Others were too confused to move about the hospital alone.

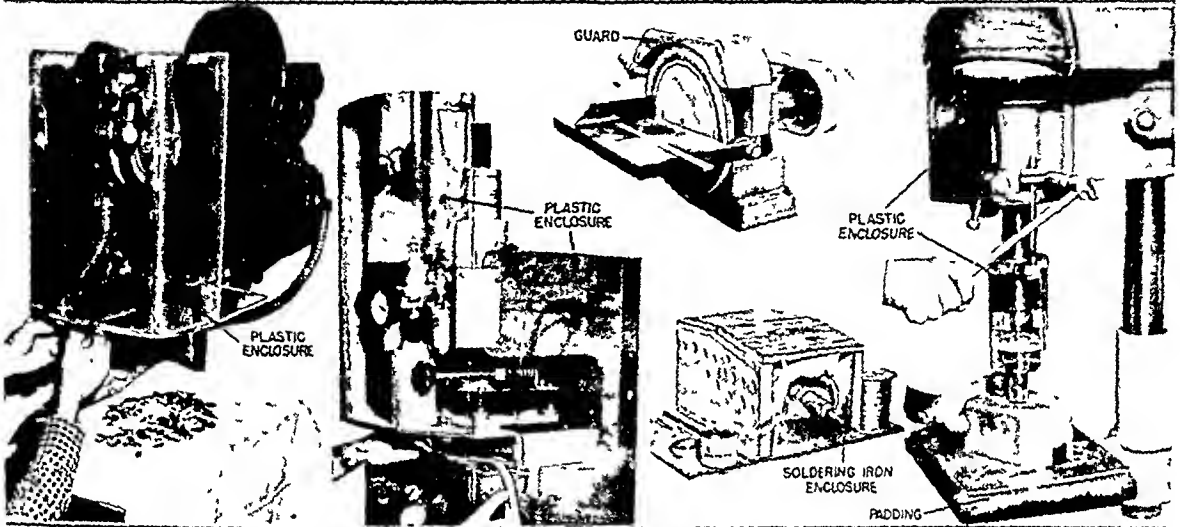
After specific medical and surgical treatment, the patients are placed on special rehabilitation wards, and, under guidance of a specialist in physical medicine and rehabilitation, are given individually planned treatment. Physical and corrective therapists build the patients' strength and coordination with exercises and teach them to walk and to perform their daily activities. Patients who have lost use of their limbs are fitted with braces. Under supervision of an occupational therapist, the elderly veterans work in arts and crafts to improve performance and their ability to adjust emotionally.

At the Veterans Administration Hospital in Fort Howard, Md., 50 out of 60 aged patients receiving rehabilitation treatment were discharged, and at the VA Hospital in Minneapolis, Minn., 25 of a group of 130 left to begin work; 40 others were discharged to their homes, and all except 10 showed significant permanent improvement.

can POWER MACHINES be made safe for use by the epileptic worker ?

Yes

THESE ARE SAMPLES OF SAFEGUARDS FIRST INTRODUCED INTO THE V.A. WORKSHOP



SOME SAFETY DEVICES HAVE BEEN REMOVED AFTER YEARS OF TESTING HAVE SHOWN THEM TO BE UNNECESSARY

Poster in an exhibit shown at professional meetings in 1955 and 1956.

ing their work and relinquishing their pension, the only form of security many of them had; and (b) giving up their work and continuing on their total non-service-connected pension.

Treatment of the rejection-and-dependency syndrome in the Veterans Administration industrial setting resulted in relinquishment of pension, the passive form of security, by 18 epileptic veterans. This voluntary surrender of the pension proves again that there are ways of motivating people, even those who belong to the hard core of unemployables, if status and self-esteem are substituted for dependency and rejection.

Limits of Job Placement

In assigning an epileptic to a job on machinery, consideration should always be given

to the dangers of the machine and to the nature of his seizures. If seizures are nocturnal or if there are distinct warnings prior to a seizure, there is no need to be greatly concerned. If seizures are of the grand mal or psychomotor type, the most important factors, according to the experience at Epi-Hab, are the level of intelligence and the degree of emotional stability of the individual.

In the beginning of the Veterans Administration project, extraordinary precautions were taken for the safety of the employees. Projecting portions of machines were covered with foam rubber and other soft padding to prevent injury in the event of seizures. Transparent plastic was used freely to cover moving parts of the machines so that they would remain in full view. However, experience has shown that the unusual safeguards are no more effective

mote economic rehabilitation of the epileptic. In both these aspects the results have been more than encouraging. The shop operates through contracts with outside firms . . . operations simulate prevailing shop practices in private industry . . . employment is voluntary and placement is eagerly desired. The program has received the commendation of many who believe it to be modeled after the best medical and industrial traditions.

The success of this endeavor not only assured its continuation but also served as a stimulus for establishing a comparable workshop in the community for all persons, veterans and non-veterans, unemployed because of epilepsy. This shop, which began operation on January 16, 1956, is called Epi-Hab L.A. Inc. It is dedicated to the reintegration of the epileptic through medical control, industrial training, employment, and placement and is supported by grant funds from the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, matching private funds, and a variety of gratuitous services from the community. These services are in the fields of law, advertising, public relations, accounting, medicine, labor, industry, and engineering.

Drawing upon experience in the Veterans Administration workshop and, particularly, in the Epi-Hab project, we shall review specific aspects of the epilepsy problem in an industrial setting.

The Reject Syndrome

Not infrequently the individual with epilepsy denies his affliction and substitutes an entity which he describes as a dizzy spell, a blackout, a weak spell, or simply a peculiar feeling. He cannot accept epilepsy as a part of his life; the stigma is much too damaging to his self-esteem. Now and then he appears suspicious and reluctant to talk about his seizures. He is usually sensitive, defensive, and resentful, and sees himself as miscast in a competitive society.

The age of onset of the seizures is a most important factor in the development of this reject syndrome. Onset during infancy or early childhood, with continuation of the attacks for a number of years, tends to contribute significantly to the molding of the syndrome. Here

one is dealing with incorporated parental fear, guilt, resentment, and concern, and the distorted attitudes of the community, which tend to structure and foster the reject syndrome. Occurrence during adolescence may interfere with growth toward independence, feelings of security, and ability to establish warm interpersonal relationships, but the damage is usually less severe than at younger ages. The effect of onset of epilepsy on the already well-formed behavior patterns of the adult may be slight.

A census study of some 100 epileptics residing in the domiciliary unit of the Veterans Administration Center in Los Angeles found that approximately 64 percent of the group had not gone beyond grade school, 31 percent had never married, 49 percent of those who had married were divorced or separated, 89 percent had an unstable work history after onset of epilepsy, 5 years was the average length of hospitalization (with a range of 1 month to 24 years), and 84 percent of the group suffered from moderate to severe psychological incapacity. The instability factors in work, marriage, and emotional adjustment presuppose absence of motivation, presence of maximum dependency strivings, and desire for custodial care. Isolationism and social withdrawal signified by unwillingness to communicate with fellow patients, feelings of resentment, lack of appreciation, diminution of confidence, and a host of other maladaptive personality traits reinforced by lack of interest and drive were the telltale characteristics of this community.

Let us see what happened when these human rejects were placed in circumstances in which their activity was rewarded, that is, in gainful employment. In this situation some of their maladjustive tendencies should be counteracted through a demonstration of usefulness by means of forced interdependence in work assignments and through a demonstration that in their community others are envious of their status, especially those domiciled for disabilities other than epilepsy.

The realignment of behavior patterns and the changes in attitudes required considerable time, patience, and effort. The crucial test of altered sentiments came when a number of these people were forced into the position where they had to choose between (a) continu-

sonality patterns of behavior resulting from a background of disruptive and traumatic experience. These people were just as maladjusted at Epi-Hab as they had been outside in the competitive industrial setting. They performed their work erratically, were unwilling to accept responsibility for adequate performance of a job, and would quit work without any apparent provocation. When they were placed on a job the performance of which fitted well their symbolic needs and defenses, however, there occurred a surprisingly marked improvement in job adjustment. Over a period of time these, as well as the other employees at Epi-Hab, began to show changes in attitude,

changes which brought them closer to integration with co-workers, family, and society.

Summary

An industrial-medical plan, called Epi-Hab L.A. Inc., aimed at the conservation of human energy and restoration of respectability among those afflicted with epilepsy has been put into operation in Los Angeles. Medicine alone cannot counteract the stresses of life that play so important a role in precipitating seizures. Happiness gained through productivity, independence, and social acceptance is as essential to the well-being of the epileptic as it is to those who are not so afflicted.

Rising Income of Blind Vendors

During fiscal year 1956, gross sales at vending stands operated by blind persons rose by 10 percent to a record \$25.8 million. Net annual incomes of the 1,804 blind operators averaged more than \$2,500, an increase of about \$187 over the previous year. In 1956, these operators and their 333 blind assistants earned an aggregate of more than \$5 million, as compared with \$4.5 million earned by 1,721 operators and their employees in 1955.

Under the Randolph-Sheppard Act, as amended in 1954, blind persons licensed through State agencies designated by the Office of Vocational Rehabilitation were authorized to operate vending stands on suitable Federal property and were given priority in setting up such businesses.

The majority of blind operators were trained by the State rehabilitation agencies under the State-Federal program. In addition to drawing up regulations for vending stand programs, the Office of Vocational Rehabilitation assists in educational efforts, surveys potential sites, and works with State agencies in developing, expanding, and improving their programs.

tive against injury than the standard measures used by industry, and many of the experimental devices have therefore been removed.

Should the person with epilepsy work with machine tools which are ordinarily considered dangerous by industry, but which would raise his level of skills and thereby increase his potential for independence? Yes, of course, he can use most of them. A few—the lathe, the heavy hydraulic press, the heavy stamping machine, the milling machine, for example—have not been considered for use at Epi-Hab. Conservative thinking is still in order, for there are definite limitations to what the epileptic can do with safety. Where to draw the line, however, is a question that can perhaps best be answered through experience. Limitations pertain more to jobs performed at elevations or to those requiring exposure to open pits, large vats containing solvents, explosive materials, and moving equipment which can cause loss of life than to other types of jobs.

Seizures and Accidents

During the first year of Epi-Hab operations, 134 applicants were psychologically and socially screened for employment, and 57 were hired, 53 men and 4 women. Of the 57 hired, 16 were released for one of the following reasons: (a) left the State, (b) obtained a job closer home, (c) was absent excessively, (d) was uncooperative, (e) had serious personality problems. The capacity of the Epi-Hab plant is 50 employees. At the end of the first year, 41 employees were holding a variety of machine, subassembly, and electronic jobs, and 9 jobs were yet to be developed and filled.

The total number of man-hours worked at Epi-Hab was 42,221. During these hours there were 205 seizures; 194 were the grand mal type, the most disturbing kind in the employment situation, and 11 were of the Jacksonian or psychomotor variety. Time lost from work because of seizures amounted to 126 hours and 41 minutes, an average of 32 minutes, at a cost of 74 cents, for each seizure. Twenty-three of the 57 employees hired, or about 40 percent, experienced seizures while in the shop. Interestingly, 10 percent of the employees had

70 percent of the seizures, and one individual had 45 percent of the seizures. The employees having most of the seizures had the majority of their attacks during the first few weeks of their employment, a finding that supports the idea of progressive decrease in seizure frequency and intensity with passage of time and acquisition of confidence in the job. The policy of the shop is to return a man to his job soon after his seizure.

Accidents recorded during the first year numbered 27. These occurred to 18 of the 57 employees, or to 31 percent of the working population. The distribution of the accidents according to type and severity is as follows: 20 accidents not due to seizures in which first aid was given and the individual returned to work immediately; 1 accident not due to seizures in which medical treatment was required for severe thumb laceration, with some time being lost from work; 4 accidents due to seizures in which first aid was given and the individual returned to work immediately; 2 accidents due to seizures in which medical treatment was required for lacerations, with some time being lost from work. Only 3 of the accidents were reportable under workmen's compensation insurance.

From these figures, it can be concluded that the amount of time lost because of accidents was negligible. The workmen's compensation insurance carrier considered the accident rate in relation to the number of man-hours worked a noteworthy achievement and possibly lower than one would expect in the ordinary manufacturing plant.

Adjustment to the Job

Epileptic employees, of course, have associated emotional disturbances. It has been necessary on occasion to deal with problems arising out of the emotional conflicts of the employee rather than from the presence of dysrhythmic cortex.

The majority of Epi-Hab's employees have performed their duties energetically and economically, often to the envy of the industrial plant subcontracting work to the Epi-Hab plant. However, among the 57 hired during the first year, there were a few with deviate per-

the middle ear, and the inner ear. The outer ear of man is not very complex. It consists simply of the visible auricle on the side of the head and the external auditory canal that forms an unobstructed passageway of air to the eardrum.

The middle ear is more complex, both structurally and functionally. It serves as a mechanical transducer of sound vibrations from the surrounding air to the fluid of the inner ear. The eardrum (tympanic membrane) separates the outer ear from the middle ear. Attached to this membrane and extending across the space of the middle ear to the wall of the inner ear are three small bones (ossicles) known as the hammer (malleus), anvil (incus), and stirrup (stapes). These tiny bones function as a kind of lever mechanism in transmitting the motion of the eardrum to the inner ear. The airspace of the middle ear is connected with the nasal cavity by the eustachian tube. This opening provides ventilation of the middle ear and permits equalization of air pressure inside and outside the eardrum.

Between the middle and inner portions of the ear are two openings in the bony partition: the oval window and the round window. The footplate of the stirrup fits into the oval window in such a way as to respond with a rocking motion when vibration causes movement of the drum membrane and ossicular chain. The round window is closed by a flexible membrane which permits movement of the fluid in the inner ear when changes in pressure occur at the oval window.

The inner ear is a highly complex and delicate structure embedded deep within the temporal bone. It occupies a space that is shaped like a snail shell and is known as the cochlea. Within the cochlea is an intricate arrangement of cells that make up the organ of hearing. This organ is supplied with nerve endings from the eighth cranial nerve, which carries auditory impulses to the brain. Adjacent to the cochlea and continuous with it are the vestibule and three semicircular canals. These chambers also have special sensory structures that are supplied by a branch of the eighth nerve. Their function is to provide the sense of equilibrium.

In addition to the specialized structures of the inner ear, the whole labyrinthine chamber

is filled with fluid that serves as the medium for conveying vibration or movement to the enclosed sensory organs.

Beyond the stage of cochlear reception hearing becomes a function of nerve and brain activity. For the most part this process defies simple description. However, some of the significant biological functions of hearing can be presented briefly (4). In its simplest form hearing is unconscious. The hearer reacts to the background of sound in his environment without being aware of most of it. Any sudden change or unusual pattern of sound is likely to raise hearing to the signal or warning level. At still higher levels of function it permits communication by language and appreciation of auditory beauty. Each of these functions is important to the comfort and well-being of the person. Even the unconscious perception of background noises establishes a sense of contact and unity with the environment; lacking it, one is likely to feel isolated and uneasy. At the signal level hearing serves the practical purposes of protecting the person and directing much of his activity. The most important aspects of this function in humans are at the intellectual and social levels, where hearing permits easy acquisition of language and fluent oral communication.

Medical Treatment

I will not attempt to review the problems of medical treatment and restoration of hearing in patients whose auditory handicap is temporary. Among children this group is large. It constitutes an area in which programs for the conservation of hearing are highly fruitful. Much of the deafness caused by infections in the middle ear or other obstructions to the transmission of sound can be corrected or alleviated by surgical or other medical treatment (5). With prompt and proper care most children having conductive deafness can be treated successfully. This is true for adults as well as children, but conductive impairments in adults are not so commonly without complications.

A significant cause of conductive deafness in adults is a change in the bony wall of the inner ear known as otosclerosis. Certain pa-

Hearing and Acoustical Handicaps

LEROY D. HEDGECOCK, Ph.D.

THE PROBLEMS attending the failure to hear normally can hardly be understood without some grasp of what normal hearing is like. This understanding must go beyond the physical characteristics of sound and beyond the organic reception of auditory stimuli. It must include an awareness of the psychological and social effects of audition. Apparently it is difficult to establish the concept that hearing may differ not only in degree but also in kind. Every clinician concerned with hearing is familiar with reports that a patient can hear "real well" and yet fails to understand much of what is said to him. Most of us know of persons who literally can hear a pin drop but still have difficulty in oral communication. Such instances, along with observation and study of persons with severe loss of hearing, point to the important fact that deafness brings about a qualitative as well as a quantitative change in the total pattern of sensory perception (1).

Sound Heard by the Normal Ear

A brief description of how we hear will illustrate some of the possibilities for difficulty in the function of hearing. Although its performance is taken for granted, the normal ear actually is one of Nature's most remarkable creations. Physicists tell us that the normal ear is capable of detecting changes as small as 1-billionth of the atmospheric pressure on the eardrum (2). For the convenience of avoiding the large numerical differences that would be involved if measurements were made in actual acoustic pressures, the measurement of sound intensity usually is expressed in logarithmic units known as bels and decibels. This system has no fixed quantity, but rather it expresses a ratio of two quantities such as double, triple,

tenfold, and so on. On such a scale the intensity range of the normal ear for a 1,000-cycle tone is approximately 120 decibels. On most audiograms the zero-decibel level represents the intensity at which normal ears can just detect a tone. Loss of hearing then is expressed as so many decibels above that intensity.

The range of audible frequencies for normal human ears extends from approximately 20 to 20,000 cycles per second. It may orient our thinking to remember that the pitch of middle C on the musical scale is approximately 250 cycles per second. The range of frequencies that are important for conveying a speech signal is from about 300 to 3,000 cycles per second. The frequencies ordinarily measured by an audiometer are from 125 to 10,000 cycles per second.

The total number of pure tones that most ears can distinguish on the basis of both frequency and intensity is on the order of 340,000 (3). We know, of course, that most of the sounds we hear are not of a single frequency nor at a single intensity. Instead they are combinations of many frequencies and intensities that change almost continuously. The result is that the normal ear is responsive to a practically infinite variety of sound patterns. This is possible because of the highly specialized and delicate structure of the human ear.

Structure and Functioning of the Ear

For purposes of study and description, the ear may be divided into three parts: the outer ear,

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Their speech usually remains intelligible to most listeners, although it may lack proper intonation and rhythm. Early attention to visual, tactile, and kinesthetic sensations should do much toward maintaining adequate speech after loss of hearing.

The speech of persons with partial deafness may be expected to vary with the type, degree, and conditions of onset of deafness. The partially deaf person most commonly hears the vowel sounds and most of the rhythm patterns while missing many of the consonants and much of the inflection of the voice. Frequently this results in articulatory difficulty and some degree of monotony in vocal quality. Partially deaf persons are likely to be unaware of their speech disorders because they reproduce speech as they hear it. The first step in treatment for this group is to determine whether amplification will improve the auditory signals that are desired. The majority of those with moderate to severe deafness can learn to use a hearing aid to some advantage. Occasionally the use of a hearing aid is the only requirement for adequate rehabilitation of a partially deaf person; more often it is necessary or at least desirable to provide training in auditory, visual, tactile, and kinesthetic perception.

Use of the Hearing Aid

It is impractical to lay down a rigid set of standards for the determination of benefit from a hearing aid. Most of the values are relative. That which is significant to one person may be unimportant to another. Even two individuals whose audiograms are identical may not benefit equally from amplification. One may distinguish sounds well enough to derive considerable help in understanding the speech of others, while another may benefit primarily by the increased sensation of his own voice. No person with perceptive deafness should expect complete compensation. A hearing aid does not improve the ability to hear; rather it may improve the signal to be heard. Despite this fact and despite all the limitations and problems imposed by hearing aids, they have been a tremendous boon to millions of people with partial deafness. Certain general principles and guideposts may be used in helping to determine who should wear a hearing aid.

It is appropriate to consider a hearing aid for most persons with a permanent loss of hearing in the better ear of between 35 and 95 decibels for speech frequencies. The greatest degree of benefit and satisfaction from amplification is likely to be experienced by those with hearing losses for speech of from 35 to 75 decibels. Most persons in this group can learn to use a hearing aid well enough to permit satisfactory communication under favorable circumstances. The majority of them can develop and maintain intelligible speech. With a combination of personal initiative, proper training, and use of a hearing aid, the handicap produced by moderate degrees of deafness can be reduced to a minimum. In most instances it need not interfere with pursuit of normal vocational and social activities.

It is not uncommon to find individuals with losses of from 75 to 95 decibels who cannot tolerate enough amplification to do any important good. This is the usual circumstance for those with losses greater than 95 decibels in the speech frequencies. Nevertheless, if any hearing for speech remains, it is advisable to try a hearing aid and to provide training in the use of residual hearing. As a general rule, those who have heard enough to acquire normal speech and language before their loss of hearing will derive greater benefit from amplification than those who have never been accustomed to interpreting sound patterns. Also, those whose audiograms are relatively flat may expect better results than those with markedly falling curves or other highly irregular patterns of auditory threshold.

The physical inconvenience of hearing aids has always been a factor in discouraging people from using them. This, combined with false pride and the substantial expense of the instruments, has deterred their acceptance to a considerable extent. The fact that a moderate impairment of hearing is not readily apparent seems to promote the tendency to hide it, or even to deny its existence. This obstacle and that of inconvenience have been reduced greatly in recent years by the development of small, highly efficient, inconspicuous instruments. It is obvious that consumers have paid for this development by numerous and ex-

tients with this condition are suitable candidates for the fenestration or the mobilization operations. If such treatment is successful, these patients usually regain sufficient hearing to understand speech satisfactorily although the acuity for sound is not likely to be entirely normal.

A significant number of children and the majority of adults with difficulty in hearing have some degree of perceptive deafness. This means that either the inner ear or the auditory nerve fails to respond normally to sound. In most instances this type of deafness cannot be corrected by any type of treatment, and for many of this group, compensation by the use of hearing aids and educational rehabilitation are particularly important.

Compensatory Skills

The variations that may occur in auditory impairments are many. However, there are basic principles that apply to deafness in general. The problems of each individual may be expected to vary not only with the type and degree and age at onset of his deafness, but with other physical and mental characteristics and with the environment in which he functions.

Despite some misconceptions about the more subtle problems that are created by deafness, there is general cognizance of the basic nature of the handicap. Most enlightened persons now realize that deafness is primarily a sensory deprivation and an obstacle to communication rather than an intellectual defect as it was once thought to be. Most people know that deafness usually can be compensated for to a successful degree by the development and utilization of other senses and skills. They know that most deaf persons can and do take responsible and productive places in society. It is doubtful, however, whether many people are aware of all the means by which this compensation is achieved. Probably few understand the pervasive psychological and social significance of deafness. The very fact that the communicative handicap looms so large tends to obscure other aspects of the problem.

In the normal person, hearing and vision work together in a supplementary relationship to orient him to both his immediate and his

distant environment. Vision is directed primarily to the foreground, while hearing is non-directional, encompassing the background as well as the foreground. Vision is limited by darkness and by obstructions and is essentially nonfunctional during sleep. Hearing functions keenly in the dark, around corners, through most doors and walls, and even to a substantial degree during sleep. If this comparative analysis of the two major senses were to be continued into every detail of our lives, we would understand why Helen Keller has said that she regrets the lack of hearing more than she does the lack of sight.

In the absence of hearing, vision must carry most of the burden of perceiving things at a distance, although the tactile sense may be employed for this to some extent. For example, most deaf persons are able to feel the vibrations produced by an airplane overhead or a clap of thunder or the stamp of a foot on the floor. From time to time speculations have arisen as to whether the deaf as a group possess keener visual acuity and sharper powers of observation than do those with normal hearing. Although this supposition has not been demonstrated conclusively, it has a sound underlying premise. It acknowledges that the security of the individual is threatened by the sensory defect and the individual thus threatened is challenged to mobilize his remaining resources more effectively. He develops compensatory skills in order to meet the demands of his environment.

In addition to visual and tactile impressions, the deaf person may develop an acute awareness of kinesthetic sensations. This helps him to feel and interpret his own movements more effectively and becomes an important gauge for controlling the production of speech. Individuals differ in the extent to which the kinesthetic sense develops naturally, and no method is certain to produce efficient kinesthetic control of speech muscles. However, if a patient is properly encouraged to attempt speech and to pay close attention to the visual and tactile clues, he can usually establish some muscular feeling for speech (6).

Persons who lose their hearing after speech has developed usually retain much of their articulatory skill, but over a period the quality of their voices is likely to change considerably.

the production of a voiceless consonant. When it is attainable, the emphasis in discrimination is placed on interpretation of speech. Listening for pleasure is encouraged by using rhythm and music for auditory stimulation.

Both the starting points and end results of auditory training vary widely for different individuals. Some may never achieve more than gross discrimination, while others can learn to distinguish words effectively. Although the degree and type of deafness and the effectiveness of auditory training usually are related, no fixed rule can be applied to determine the exact value of such training. It must be assumed that all persons with some residual hearing have the potentiality for utilizing it to advantage. An extensive program in auditory training is recommended particularly for children who have never heard well enough to acquire normal speech and language and for all those who experience unusual difficulty in adjusting to a hearing aid. Hopkins and Hudgins (8) have suggested that even though it is not possible to predict from the audiogram how much a child will profit from auditory training, all acoustically handicapped children seem to derive some benefit from it and should have every opportunity to continue training throughout their school lives.

Schools for Children

Children with deafness of less than 60 decibels for speech usually can adjust and make satisfactory progress in the regular classroom if they have learned to wear a hearing aid and are given a moderate amount of special help in the development of communicative skills. Those with losses of between 60 and 75 decibels are likely to need a substantial amount of special help, but many can participate profitably in the program of the regular school. If proper instruction is available and if adequate adjustments are made, it is desirable to keep these children in the regular classrooms. When circumstances are not favorable for a partially deaf child in the regular classroom, or if he fails to adjust to this environment, it may be necessary to provide a special class or special school environment. For children whose deafness for speech is greater than 75 decibels, it

usually is best to provide a special school that is large enough for appropriate grouping and is staffed by teachers who are highly trained for teaching the deaf (9). Those whose losses of hearing for speech are greater than 75 decibels usually have considerable difficulty in learning; the results are limited even after a period of training and adjustment.

Speech Reading

When hearing is absent or nearly so, the principal means of compensation is visual perception. Regardless of the degree or kind of deafness, lip reading—or more properly, speech reading—can play a vital role in the process of rehabilitation. For countless numbers of persons with mild impairments of hearing, the practice of speech reading permits adequate adjustment for normal activities. For those who are severely deaf it is the chief means of understanding the speech of others. For those with moderate degrees of deafness it complements the auditory function in a remarkable way. Fortunately, the elements of speech that are weakest in acoustic power, and therefore are heard poorly, have distinctive positions or movements that are readily visible.

All persons who see adequately can read speech to some extent. Every gesture and expression that a speaker exhibits gives the listener certain information. As gestures of the hands and body can come to have meaning, so can motions of the lips, tongue, and face. Interpretation of these motions is, of course, the skill known as speech reading. It must be borne in mind that by no means all the positions and movements of the speech structures are visible to the observer. He sees only partial patterns and those only fleetingly. There are several pairs of consonant elements in which positions and movements are visibly the same. This causes many words and phrases to appear identical. Often the speech reader must rely on context and a sense of appropriateness to determine what has been said. Differences in the way people speak also contribute to the problems of the speech reader. People who talk with little movement of the lips with cigarettes and pipes in their mouths are difficult to understand. Extremely rapid or unusually slow speech is hard to interpret. Unique skill



1FIP Photograph

Auditory training in speech discrimination with background noise.

pensive purchases of hearing aids. It is no secret that many users of hearing aids have bought 2 or 3 or even more instruments before they learned to use one effectively. The justification for the usual price of a hearing aid is that the agent is supposed to provide extensive service to those who find it difficult to learn to use the instrument. Part of the adjustment of a person who wears a hearing aid includes an understanding of the operation and maintenance of the instrument (7).

Auditory Training

Auditory training and practice in listening can play an important part in the adjustment

to a hearing aid. Many new sounds are introduced by the use of an instrument, and virtually all sounds are changed in quality. It is difficult for many persons to become accustomed to these changes. Although they receive more sound than they did without amplification, it may have little value until they learn to interpret it. This learning may be facilitated by instruction and systematic practice. In a complete program of auditory training, opportunity is provided to progress from relatively easy distinctions between sounds that are grossly different to finer and more complex discrimination. The stimulation may range from the booming of a drum or blaring of a siren to the rustle of leaves or

Program for the Cerebral Palsied

WILLIS C. GORTHY, C.E., and MARTIN G. MOED, A.M.

CEREBRAL PALSY is characterized by paralysis, weakness, incoordination, tremors, involuntary motion, excessive rigidity, or stiffness caused by pathology of the motor centers of the brain. This affliction may apply technically to adolescents, adults, or the aged. However, cerebral palsy is usually considered to mean those conditions resulting from an anomaly, injury, or disease that originates in the developing infant before or during birth or in the first years of growth (1a).

Damage to the brain may result in involvement of the upper and lower extremities and frequently includes the muscles of the trunk, neck, head, face, and breathing mechanism. Because cerebral injury is not limited to a single area in the brain, numerous associated defects may accompany motor involvement. These may include one or more defects in speech, hearing, or vision, mental retardation, convulsions, and behavior disorders. The classification of various types of cerebral palsy is based on physical signs. A high percentage of cases may be classified either as spastic or athetoid types. In athetosis the individual displays involuntary, incoordinate, uncontrollable, purposeless movements. The spastic condition is characterized by the appearance of stiffness. Usually the spastic is able to move the affected limb voluntarily, but the motion may be explosive, jerky, slow, or poorly performed (2).

The number of cerebral palsied in this country is difficult to determine. Three major studies analyzed in 1955 indicate that the prevalence

rate of cerebral palsy is between 300 and 350 cases per 100,000 population (3). Of this number, 100 cases are under 21 years of age and 200 are 21 years of age and over. On the basis of the above figures it is estimated that the total number of cases in the United States falls between 495,000 and 577,500.

Habilitation

Because of the congenital or early life injury, the cerebral-palsied child will grow and develop in an atypical personal and social environment. This often leads to a poorly adjusted, dependent, socially incompetent person who may be more disabled by personality deviations than by his physical or mental limitations. An individual handicapped later in life has had an opportunity to develop normal living patterns. A child handicapped throughout life has not. This factor underlines the essential difference between habilitation and rehabilitation. The development of basic life adjustment patterns as part of treatment and training is the goal of habilitation. Through this process, individuals are helped to become independent and useful citizens within the limits of their disability.

The process of habilitation must, therefore, begin early if it is to help the child develop proper habits and attitudes about himself and others which will serve as a constructive basis for adjustment to the demands of society.

It is desirable to achieve the following habilitation goals (1b):

- The patient should be capable of some form of locomotion, either independently or by means of crutches or other types of apparatus.
- He should be capable of self-care and self-

Mr. Gorthy is director of the Institute for the Crippled and Disabled in New York City, and Mr. Moed is coordinator of the cerebral palsy work and evaluation project at the institute.

and artistry is required for becoming highly proficient in speech reading. On the other hand, nearly everyone can do it to some degree; but often the main task in teaching speech reading to adults is to convince them that it is within their power to grasp it.

The ability to read speech varies just as other abilities do. In some it develops naturally, even without special training. Others require laborious teaching, and still others never become proficient. It seems to depend more on an inherent knack or aptitude than on general intelligence or diligent study (10-12). The person who can seize partial clues instantaneously and synthesize them into meaningful patterns is likely to be adept at reading speech.

It is difficult, if not impossible, to assess or predict the degree of accomplishment that will result from instruction in speech reading. Nevertheless, it is appropriate to provide well-planned programs of instruction and practice for all those with a significant impairment of hearing. Practically all educational programs for acoustically handicapped children should and do include training in speech reading. Many programs of instruction for adults as well as children are made available by the chapters of the American Hearing Society and by other agencies such as university clinics for speech and hearing therapy and community evening classes. There is need for expansion of these services, but an ever greater need is for the acoustically handicapped themselves to learn of the benefits that can be gained by a determined effort to overcome their handicap.

Comment

Important as oral communication is, it is not the only means of communication and it is not a prerequisite for acceptable behavior or competent performance of many tasks. The deaf or hard of hearing person should be encouraged and guided in the development of appropriate compensations that will provide a sense of security and satisfaction. Frequently, this may be done most effectively by emphasizing activities and abilities that are not directly dependent on hearing. The deaf person who excels in his work or play, whatever it be, will find that the communicative problem is lessened. Actions do indeed speak more

strongly, if not louder, than words. An accurately drawn blueprint, or a finely tailored garment, or a beautifully prepared meal will speak eloquently for itself. The producer need not give nor listen to an oration on its merits.

Auditory impairment of any degree need not interfere with acceptable behavior and development of a child nor with useful and happy adjustment of an adult. Acceptance of this premise should not be interpreted to mean that deafness is no handicap. On the contrary, it must be recognized that any significant degree of deafness imposes a serious deprivation. Only by acknowledgment and careful assessment of the handicap can proper adjustments and appropriate compensations be made.

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The process of habilitation must, therefore, begin early if it is to help the child develop proper habits and attitudes about himself and others which will serve as a constructive basis for adjustment to the demands of society.

It is desirable to achieve the following habilitation goals (1b):

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help in eating, dressing, toileting, and similar activities.

- He should possess an effective means of communication, by speech, writing, or other means.

- He should appear as normal as possible.

- He should be able to earn money, or its equivalent, through his own efforts either in competitive industry or in a sheltered workshop.

- He should be able to employ his spare time in self-satisfying avocations and in social contacts.

To achieve these goals, habilitation of the cerebral palsied cannot be considered from a single aspect. Emphasis must be placed on the problems as they affect the "whole child." Unless the medical, psychological, social, educational, and vocational needs of the individual are integrated into a program, the cerebral palsied will not be served adequately. The multiplicity of handicaps creates diverse and complex problems necessitating the provision of many types of costly services and a lengthy habilitating process. It is rarely possible for one group working alone to provide the necessary services. The responsibility for service must be shared by the individual, the family, and the community, all working toward a common goal.

Community Planning

Total habilitation requires the interrelationship of all health services. These depend on one another and must be closely coordinated to be fully effective. By utilizing the entire resources of the community, the highest potential of the cerebral palsied can be developed. Only in this manner can the economic burden on the family be relieved and the child grow up to become a productive, better adjusted member of society.

In a sound community program special services for the cerebral palsied will be integrated with the existing general health, welfare, and education programs. If necessary, the various agencies should modify existing programs to meet the needs of the cerebral palsied. One way of accomplishing this is to employ specialists in this field to work with the personnel of the general service agencies. If proper facili-



A buttonhook assists a trainee in dressing. The Institute for the Crippled and Disabled makes much use of such simple devices in furthering self-care abilities.

ties do not exist or cannot be extended or supplemented, it may be necessary to establish separate services for the cerebral palsied (4a). However, such services should be based on need rather than on the desire of a small group to control a separate program.

The community plan for direct habilitation services should include—

- Help for the parents and family as early as possible so that they can learn to live with and understand the child with cerebral palsy.

- Medical services which have the facilities for early diagnosis, therapy, surgery, and general health care.

- Special educational programs that meet the needs of the child with brain damage and associated disabilities, especially mental retardation.

- Vocational guidance, training, and placement to help develop full use of the individual's vocational capacities.

- Sheltered workshops for those who cannot meet the competitive demands of industry and for those who need special work preparation.
- Homebound work programs when workshops are not available or are inaccessible.
- Recreational or diversional activities to meet the needs of those who are too disabled to perform in a workshop program.

Parent Services

Although parents are not usually considered as a service, no one else in the child's program will become more involved in habilitation. The parent might be considered as a catalyst. With proper care, favorable attitudes, support, and encouragement, the child's chances for success can be greatly enhanced. Without proper parental help and guidance, the child's chances for performing at maximum capacity will be retarded. Because the mental health of the family is a vital part of the habilitation process, it has become a requisite in the treatment of the cerebral-palsied child to clarify parental attitudes concurrently with the child's therapeutic program. If aid for the family unit is planned as part of the complete treatment program, the chances for success of the habilitation effort will be increased.

The emotional impact of having a crippled child; the feeling of guilt, resentment, and insecurity; and the practical everyday problems of raising the child must be carefully considered. Some of these problems can be alleviated through educational and counseling programs and by forming parent groups who will share the fatiguing burden of constant care and attention. Through education, parents get an opportunity to understand the needs, wants, abilities, and limitations of the cerebral palsied. The program should stress the parents' role in encouraging the child to develop independence and especially in striking a balance between too much protection and encouragement and too little. Through counseling programs the parents gain insight into their feelings of guilt and ambivalent attitudes toward their child and the reasons for family conflicts. By study, observation, and counseling they will come to see their cerebral-palsied child more objectively as an individual

and as a personality. In this manner a sounder parent-child relationship can be established (4b).

The parents become the cornerstone upon which the child builds a foundation for adjustment. Behavior maladjustment in the cerebral palsied may result from organic brain damage, frustration caused by the handicap, or rejection by the parent, family, or society. It is, however, generally believed that environmental factors have a greater effect on personality deviations than the brain injury condition. The personality characteristics of a secure, mature, loved child may have greater prognostic significance than the disability itself. A leading medical authority in the treatment of cerebral palsy states, "As yet no one is able to prognosticate what a well-motivated child with even a severe disability and mental retardation can accomplish if given adequate treatment and parents who are interested in helping the child" (5a).

Medical Treatment

Treatment and habilitation of the cerebral palsied should be used synonymously. The overall therapeutic approach must take into consideration that the child has not been able to develop normally. It must, in addition to therapy, help the child gain security, promote relaxation, and relieve anxiety in both the child and his parents (6a).

The goal of treatment is to help the individual function as effectively as possible with special emphasis on learning to perform activities essential to daily living. The logic of the treatment aims is pointed out by Deaver. "Learning to perform the activities necessary for daily living begins as soon as the disabled person awakens in the morning. There is little value in being able to ambulate if one is unable to get out of bed, dress, or attend to one's toilet needs. The abilities to ambulate, speak, use the hands in self-care activities, write, or produce salable goods are necessary for economic independence. Education is desirable but no one is paid for the knowledge in his head. If a person cannot speak adequately or use the hands, of what economic value is an education? It is for these reasons that learning to perform the

activities essential for daily living should be the primary objective of all treatment" (5b).

The general methods of treatment are physical restorative services, surgery, drug therapy, and treatment for associated defects. Physical restorative services are more frequently recommended than any other type of treatment. Among these services are physical therapy, occupational therapy, and bracing aids.

Physical therapy is primarily concerned with improvement of locomotion, stretching exercises, muscle reeducation and strengthening, and improvement in balance. Occupational therapy is mainly functional. It attempts to teach and develop self-help skills and feeding and dressing techniques. This is usually accomplished through exercises designed to improve reach, grasp, and fingering abilities. Bracing is the principal method used for preventing and correcting deformities, supporting the body weight, and controlling involuntary movements (1c).

Surgery and drug therapy are used as aids in achieving physical restoration. Surgery is utilized only to surmount some definite obstacle to progress. The purpose is to improve functional mobility and appearance. In general, there is a cautiousness concerning surgical intervention. It has been stated that physical restoration in growing children, such as achieved by physical therapy and bracing, should always be given an adequate trial before surgery (7). However, there have been enough advances reported in orthopedic and neural surgery to consider it a major treatment method.

Drug therapy has been used with widely varying results for convulsions and muscle relaxation. A great deal of research is presently being conducted on all phases of drug therapy. The control of seizures through the use of such drugs as Dilantin and phenobarbital has been found effective and is presently widely used. It was found in a study just completed at the Institute for the Crippled and Disabled that certain drugs tend to relax tight or spastic muscles, making therapeutic exercises more effective. Another drug used in the same study was found to help reduce athetoid tremors and uncontrolled movements. The

reason seemed to lie in its unique ability to prevent emotional tension from restricting physical performance (8).

Any handicapping conditions accompanying cerebral palsy should be treated as early as possible for they can seriously impair the entire habilitation effort. The child who cannot express his feelings because of serious speech involvement may find an outlet in a temper tantrum or negativeness which in turn may interfere with a consistent therapy program. Speech therapy assists the child to improve the ability to communicate by means of speech or other methods. It attempts to develop proper breathing habits and improve such secondary factors as drooling, grimacing, swallowing, and chewing. The speech therapist also gives audiological assistance to those who need hearing training. The cerebral palsied with visual perceptual impairment may have more difficulty learning to travel independently because of the inability to judge distances of an oncoming vehicle. An untreated squint, for example, may result in deterioration of vision. Qualified ophthalmological care is essential to improve crossed eyes, prevent and treat impaired vision, and relieve headaches or other results of eye strain. Dental care and nutritional needs must also receive continual attention (9).

The complexity of the varying handicapping factors makes it difficult to prognosticate the benefits to be derived from treatment. Parental acceptance and understanding, severity of the physical disability, and mental capacity are important considerations. Denhoff suggests the use of the pneumoencephalogram technique to determine the degree and location of brain lesions. These findings have been used as a basis for predicting potential for "good futures" (6b). However, he cautioned that this technique does not take into account the multifaceted problem of personality, family, or social factors, which also influence the achievement of habilitation goals.

Educational Planning

Education must be considered as part of the total habilitation process and cannot be realistically separated from other therapy the child receives. In most communities, clinic activities



Playback and mirror aid in speech therapy.

and educational programs are planned together to provide for a closely integrated program of physical therapy, occupational therapy, speech therapy, and special education. The therapists and teachers, to be fully effective, should at the same time aim at the common goal of developing a well-adjusted child as far as physical and mental abilities allow. Especially is it necessary that the educational process help establish a feeling of self-respect and self-confidence, and provide the opportunity to achieve success and gratification. The cerebral palsied must be helped to face his limitations realistically and at the same time be encouraged to utilize his capacities to the fullest.

Brain injury can so complicate the normal learning process that it is important to know

about mental as well as physical limitations. By being thoroughly familiar with each child's problems, the most appropriate teaching techniques can be utilized. For example, many cerebral palsied with visual perceptual deviations have great difficulty seeing what others see when they look at the same object. It may appear distorted to the child, leading to an inappropriate or incorrect interpretation. The influence of this difficulty on the ability to read may be very handicapping and will probably affect the whole course of the individual's academic development. If this visual defect is known before assignment to a class, techniques such as special lighting or having the child hold reading material on a vertical rather than a horizontal plane may improve performance.

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Educational Planning

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emotional difficulties. These findings indicate that a proportion of the cerebral palsied are too handicapped physically to be able to compete under normal industrial conditions. This creates a severe and irresolvable vocational problem unless some special resource is established to meet these employment needs. In some instances this might be a sheltered workshop, a homebound work program, or, for those very severely involved, a recreational or diversional program. The study indicates that the inability to adjust vocationally is due, in part, to the lack of vocational facilities. This limitation is a major contributing factor which intensifies the behavior disorders prevalent in the adult cerebral palsied. It was noted that the young person who is severely handicapped does not display the extent of personality deviation that is apparent in the older person who has been idle for many years.

As pointed out in a previous section, there are few vocational training opportunities for the cerebral palsied. In the group that demonstrated employment potential, 92 percent had not received any vocational training, although 32 percent had completed high school. This factor is particularly serious for the habilitant whose experience is so restricted. Adequate training, even if it is at the lowest skill level, can instill in the individual a feeling of personal worth and confidence. It also can help the cerebral palsied to learn the importance of taking responsibility, of following instructions, and of getting along with others. These are basic factors in making a satisfactory vocational adjustment and are important in the habilitant's development.

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Speech Problems of Hemiplegics

MARTHA TAYLOR, M.A., and HOWARD A. RUSK, M.D.

ONE of the most significant disabilities in terms of the number of patients seen is hemiplegia, usually the result of brain damage following thrombosis, embolism, hemorrhage, or trauma. Some idea of the magnitude of the problems may be gleaned from the fact that vascular lesions affecting the central nervous system ("stroke") is listed as the third major cause of death in the United States, ranking behind only heart disease and cancer. The majority of patients sustaining a stroke of apoplexy do not die from the initial insult. Instead, they improve to a greater or lesser degree and often live a number of years despite their residual disabilities. No definitive statistics are available on the number of hemiplegics in the United States, but estimates have been as high as 1,500,000.

One aspect of hemiplegia which is far too frequently overlooked is the communication disabilities resulting from brain injury among a high percentage of hemiplegic patients, especially those whose hemiplegia is on the dominant side. Conventionally, it is assumed nothing is to be done for such patients, whereas in fact these disabilities are frequently remediable. These communication problems may be of two kinds, aphasia or dysarthria.

Aphasia

Aphasia is a language disability which affects one or more aspects of language: speaking, reading, writing, or understanding. Aphasia may also involve difficulty in calculation or in using gestures. The possible predominant symptoms of the four types of aphasia are shown in the chart.

Patients who have hemiplegia with accompanying communication difficulties are classified, after testing and evaluation, on the basis of these symptoms. It must be remembered that "aphasia" can apply only to cases in which there is known brain injury.

Among aphasic patients the range from mild to severe difficulty is wide. Therefore, the term "predominantly expressive type aphasia" may be applied to an individual who has only occasional difficulty in finding an appropriate word and may be slowed down in his ability to write words, as well as to an individual who is totally unable to express his thoughts in written or spoken words. In the first example the patient described might still be capable of adequate on-the-job performance despite his language disability. The patient in the second example probably will not be able to work and will be forced to lead a sheltered life at home or in an institution.

It is essential that the aphasic patient's functional language ability be assessed at the time of evaluation. The language demands of daily life, for example, telephoning and reading street signs, form the basis for this functional evaluation and for future therapy. Obviously, it is considerably more important for the aphasic patient to be able to say his name, to sign a check, and to ask for a drink of water than it is for him to be able to recite the alpha-

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bet, spell a given list of words, and diagram sentences from their grammatical components.

At evaluation, the patient's ability to meet the language demands of daily life are classified, from highest to lowest, according to four functional levels: vocational adequacy in language, home adequacy in language, rehabilitation center adequacy, and institutional adequacy in communication.

Patients at the first language level may qualify for vocational placement, although not necessarily in their former vocation.

Patients on the second level can function at home. They are able to make their daily wants known and have sufficient receptive ability to manage the telephone, to read, to understand signs, and so on.

Patients with rehabilitation center adequacy are considered able to follow a rehabilitation program. Their comprehension is adequate to

permit attendance in group and individual classes. They can use the elevator without assistance and can follow the nurse's and the therapist's instructions.

Patients who have only institutional adequacy in communication are unable to perform any of the higher level activities.

The principal factors which affect the patient's progress during language rehabilitation are motivation and "need" for speech, extent of damage and severity of symptoms, ability to learn new material, and attitudes of the patient's family toward his language problem. In addition, the patient's personality before the onset of aphasia seems to have an effect on his language recovery. In some patients who were very withdrawn premorbidly, the effect of an aphasic condition appears to be minimal; their "need" for language is limited. On the other hand, persons who were greatly depend-

Possible Predominant Symptoms of Four Types of Aphasia

Expressive symptoms

Receptive symptoms

| | | |
|-------------------------------------|---|---|
| predominantly EXPRESSIVE | Mild to severe difficulty in <i>using gestures with or in place of speech</i> <i>naming objects</i> <i>speaking phrases and sentences</i> <i>carrying on a conversation</i> <i>putting thoughts into writing</i> | Any receptive deficiencies may exist but will not be as marked as expressive deficiencies |
| predominantly RECEPTIVE | Any expressive deficiencies may exist but will not be as marked as receptive deficiencies | Mild to severe difficulty in <i>recognizing people</i> <i>recognizing objects</i> <i>understanding speech</i> <i>understanding written language</i> |
| EXPRESSIVE-RECEPTIVE (mixed) | All predominant expressive symptoms | All predominant receptive symptoms |
| GLOBAL | No apparent ability to express oneself by gesture, speech, or writing | No apparent understanding of spoken or written language |

ent on language skills premorbidly for their social and intellectual welfare are more likely to feel a greater need for language.

Our experience shows that, with few exceptions, all aphasic patients who have had the benefit of language retraining will make some measure of progress. It can be anticipated that some patients will graduate from one functional language level to another during the course of treatment. In a smaller number, we can expect almost complete return of language function.

Functional language recovery is the primary goal of a language rehabilitation program. Patients who learn language which they can use only under certain clinical circumstances or which they can produce only as automatic responses to specific stimuli are not considered to be making progress. It is the improved ability to use language appropriately when there is a demand for it, without assistance, under average circumstances, that constitutes progress.

Most aphasic patients who are admitted to a language rehabilitation unit are just beginning to use nouns. Therefore, a large number of the techniques devised for use in aphasia retraining are based on learning at the "naming level." Every sensory avenue is utilized to teach the patient language. His hearing and vision are employed. On the naming level the patient is familiarized with the language symbols through seeing the live objects which the noun represents and seeing the word which applies to the object, hearing the word repeated by the therapist, copying the word, matching the word with the appropriate object, and writing the word from dictation.

The proper selection of the vocabulary to be taught to the aphasic patient is essential to a sound retraining program. This is especially true when the patient will be able to learn only a limited vocabulary. If the vocabulary is not functional and realistic, much valuable therapeutic time will be wasted. A basic word list of 100 functional nouns has been designed, and copies are available from the Speech and Hearing Therapy Department, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York, N. Y.



A hemiplegic patient with aphasia receives speech therapy from a speech therapist.

The physical factors conducive to successful aphasia rehabilitation should be borne in mind when the retraining program is initiated. Sessions should be short and frequent rather than long and infrequent. A quiet, undistracting setting is advisable. The atmosphere for therapy should be permissive, and each session should end on a successful note for the patient.

It is the goal of therapy that the patient's production of each word be as close to normal as possible. However, little or no attention is given to pronunciation; it is more important for the aphasic patient to be fluent than to be perfect in his pronunciation. When a patient has learned a majority of the nouns in the 100-word vocabulary, he is taught verbs in combination with these nouns; for example, pencil-write, spoon-eat. The order of teaching words, according to their difficulty, is nouns, verbs, adjectives, conjunctions, pronouns, articles, and prepositions. In general, the "picturability" of a word and its familiarity to the patient determine its difficulty. Therefore, the names of objects are easiest to teach the aphasic patient. On levels above the noun-verb level, teaching materials designed for teaching English to foreign students are useful.

Contemporary thinking in the field of aphasia rehabilitation seems to indicate that there is a great correlation between language stimulation through listening and language learning. Ear training through repetitive listening can be accomplished by the therapist's

frequent repetition of words and by the use of a machine which repeats words from specially designed tape-recorded cards. Generally all types of auditory training should precede actual speech training and should be used as a supplement to formal speech training.

In any given case of aphasia, it is difficult to ascertain how much therapy will be necessary for the patient to reach his maximum level of language proficiency. Retraining the aphasic patient is a slow process, which usually takes many months. Experience tells us that a trial period of therapy is indicated for all aphasic patients in order to determine whether or not treatment will be of benefit. In many cases, once therapy has been initiated, the aphasic patient can follow a home program under the supervision of a trained therapist or in conjunction with a speech therapy program (1).

Dysarthria

Dysarthria is a speech disability based on motor dysfunction of the speech musculature. Dysarthria may affect the production of certain speech sounds, the rate of speech, voice quality, phonation, rhythm, articulation, or any other aspect of speech dependent on motor ability. Some dysarthric patients may be so severely deficient in their speaking ability that they are "mute" or unintelligible. In mild cases of dysarthria the patient has only a slight difficulty in speaking distinctly.

The principal goal of therapy for the dysarthric patient is to increase the intelligibility of speech. To accomplish this the following techniques may be used: imitating and practicing specific sounds before the mirror; repetitive ex-

ercises to improve voice quality, resonance, phonation, or articulation; using the tape recorder for critical self-analysis of speed; performing certain physical exercises to increase the accuracy of tongue, lip, and jaw movements. These therapeutic techniques can be of increased benefit to the patient if they are supplemented by home practice.

The potential for the functional recovery of speech skills in the dysarthric patient is usually rather good. Compensatory movements which are nearly normal can often be taught to the dysarthric patient. Many dysarthric patients are able to return to their former vocations following a period of speech therapy.

The differential diagnosis between dysarthria and aphasia is especially important since treatment and functional potential in these two disabilities differ. It is recommended that all hemiplegic patients who exhibit difficulty in communication be evaluated by a professional speech therapist. With this evaluation as a baseline, formal speech therapy techniques and plans for a home program can be more efficiently devised for the patient's recovery. The large numbers of hemiplegic patients with difficulty in communication who have recovered functionally should encourage professional workers in allied fields to refer patients to speech therapists for evaluation and treatment whenever possible.

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AUTHORS' CORRECTION

In the article Contributions of Premarital and Prenatal Bloodtesting in Syphilis Control by Harold J. Magnuson et al., published in the February 1957 issue of *Public Health Reports* (vol. 72, pp. 135-141), a recalculation of the confidence limits on figures 1, 2, and 3 does not substantiate the statistical significance previously reported. However, conclusions based on other evidence of significance remain unchanged, and these indicate that rates of infant mortality due to syphilis have decreased with the passage of premarital and prenatal laws.

Recovery From Mental Illness

MILTON GREENBLATT, M.D.

IT IS NOT POSSIBLE to discuss with finality the essential nature of disability produced by mental illness because of the complexity of personality development, marked individual differences in adaptation to stress, and great variation in ethnic and cultural milieu in which mental illness develops. However, it is currently assumed by many psychiatrists that mental illness is based primarily on difficulties in interpersonal relations that result in frustration of instinctive needs and strivings whose satisfactions are essential for normal growth and happiness.

The blocking or thwarting of these drives leads to unpleasant states of tension whose specific expressions vary over a wide spectrum. Tension is manifested in some patients by anxiety or apprehension; in others, it is transformed into obsessions or compulsions. Some patients fix their attention upon actual or fancied somatic complaints and become "psychic invalids"; others have major disturbances in autonomic balance resulting in malfunctioning of visceral organs (psychosomatic illness). Still another group is characterized by withdrawal, preoccupation with primitive fantasies, and attempts at resolution of psychic tensions either by inappropriate aggressive action or specialized psychic experiences such as delusions and hallucinations.

From another point of view, mentally ill per-

sons suffer from deep-seated feelings of unworthiness that frequently break out in antagonism to authority, rival figures, or potential objects of affection, and that seriously impair their ability for work, play, or love.

The Five Areas

There are five principal areas in which rehabilitative efforts to assist a patient should be applied: the patient's own psyche, his vocational and educational capacities, his family, and the social and recreational aspects of the community to which he will return. This concept of rehabilitation of the mentally ill approaches that of total treatment.

Psychological rehabilitation comes first in the hierarchy of concern. We are interested here primarily in reduction or removal of clinical symptoms, resolution of disruptive anxieties and tensions, and neutralization of intrapsychic conflicts. This is primarily a psychodynamic-therapeutic problem and is best managed by intensive individual or group therapy together with all other measures available in the hospital and outpatient setting. It is worth stressing that for many patients there exists a "psychopathological ceiling" which limits adaptational growth very sharply. For these patients, the critical psychological problems first must be dealt with and resolved before further rehabilitation effort can pay off. For other patients, however, though psychological problems may be sharply limiting, marked rehabilitative gains can be made through employment of methods indicated below.

Vocational rehabilitation involves careful assessment or survey of a patient's occupational or vocational interests and capacities, testing

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his fitness through occupational assignment, developing old or new skills via occupational or work therapy, and increasing his work tolerance. It proceeds to training outside the hospital setting where indicated, assistance in job placement, and followup of vocational adjustment through contacts with the patient and, where possible and helpful, with the employer. The vocational counselor provides a link with the outside world. Often the anticipation of work and its connotation of status in the community provide a major impetus in stimulating a patient's desire for recovery.

Educational rehabilitation can often be helpful. To begin with, the experience of being mentally ill and of recovering, plus all the self-understanding that recovery usually implies, may make a profound contribution to a person's psychological education. Additional efforts to develop more fully the person's skills, talents, curiosities, and special interests are often worth while. Thus, mental hospitals have included programs of art, music appreciation, language instruction, photography, carpentry and cabinetmaking, the dance, and lectures by teachers of local institutions as part of the rehabilitative procedure. Through the stimulation and support provided by a rich rehabilitative program, many patients have discovered that totally new areas of curiosity, competence, or striving can be developed.

The patient's family is the fourth area in which rehabilitation is important. It seems clear that psychiatry in the future will involve itself increasingly with the family and its problems. Child psychiatry points the way by extending treatment simultaneously to both child and parent. Recent studies indicate that the patient's breakdown is often part of a major struggle going on in the family, with the patient the victim of character disturbances of other family members, longstanding feuds, or basic incompatibilities. The beneficial effects to the patient of hospitalization and the total plan of treatment may be vitiated unless his family also is given considerable support and understanding. Furthermore, major changes within the family may occur as the result of a patient's hospitalization, and these may in turn affect him. Mental or physical stress in one or more

family members, stigmatization of the family by friends or the community, moving to another community, or closing of family ranks against him—especially if his illness assumes a chronic course—are examples of changes likely to affect a patient adversely. Thus, the family must be brought within the therapeutic orbit if the patient's rehabilitation potential is to be realized fully.

Experience indicates that the community is one of the weakest areas of patient adaptation and one towards which relatively little treatment effort is directed. Yet it is generally felt that those patients who develop deep roots in the community are least likely to have relapses. The ex-patient may go through the motions of a job, indeed be quite productive, yet be unable to tolerate social contacts, dependent as he is upon ease and naturalness of association and confidence in himself. Part of the difficulty is the unavailability of suitable sociorecreational groups—halfway groups, so to speak—that have the tolerance appropriate to each stage in an ex-patient's reintegration.

Phases of Therapy

There are three phases of the patient's illness during which rehabilitative efforts must be applied: first, during his hospitalization; second, during his transition from hospital to community; and third, during his community life.

In the hospital, rehabilitative emphasis is on achieving a "therapeutic climate," that is, an interpersonal atmosphere calculated to undo the pathogenic relations of the patient's earlier life. Therefore, personnel in the aggregate should be accepting, sympathetic, uncritical, interested, and understanding. Within such a climate three general patterns of treatment may be stressed.

The first form of treatment is intensive, individual psychotherapeutic work with a trained, professional therapist. A steadfast, reliable relationship that explores thoroughly a patient's thinking and feeling can be a remarkable catalyst for growth.

The second aspect of treatment is "milieu" therapy, and here we imply not only the "therapeutic climate" mentioned above but also a program that makes available to the patient

many activities, diversions, and socializing possibilities. Active occupational therapy, recreation, work, and sports programs are essential. Most crucial, of course, are the relationships developed with other persons—staff or patients—in these activities. Often the milieu program can be successfully supplemented by additional group experience such as formal group therapy or patient government.

The third area of emphasis is somatic therapy. Here we include all efforts directed toward removal of physical or physiological handicaps and, in addition, specific somatic treatments, including electric shock, insulin, surgery, and pharmacotherapeutic agents.

Insufficient attention has been paid to the transitional phase of the patient's experience. Upon discharge from a hospital, most patients experience as more or less threatening the severe cultural discontinuity existing between the hospital and the community. Much effort is needed to develop carefully graded steps for the movement of the patient from the hospital to the outside world. In the case of deep-seated chronic illness, weeks or months of arrest in various transitional phases may be expected before the patient is secure enough to resettle himself independently in the community. In this report we can do little more than mention the types of transitional facilities that may be offered:

The day or night hospital. The day hospital has been developed to allow early discharge of patients from hospital residence; however, they may continue their association with the hospital in whatever capacity is needed by returning during the day. This is especially suitable when the home environment is too difficult for the patient to endure for the full day, when patients are as yet unable to work on their own, and when long-term contact with the "therapeutic climate" is necessary. Night hospital patients work during the day but return to the hospital overnight.

The sheltered workshop. The sheltered workshop is most useful when it follows a well-developed work program within the hospital. The patient can absorb additional work training and work "hardening" in a sheltered workshop, where conditions of industry can be approached progressively.

The halfway house. The term refers to a residence arrangement, usually under the guidance of a supervising person, for patients who might profit by group or dormitory living and can earn and help pay for their maintenance. Patients who have no home to go to or who cannot anticipate comfortable acceptance at home may do very well in a halfway house.

Family care. Family care programs may be very successful, especially for chronic patients. The patient is placed with a selected family where he becomes a member who works or contributes up to his capacity. The State or philanthropic agency foots the bill, and the hospital usually maintains supervision through a social worker or public health nurse.

The ex-patient club. Patients and ex-patients have shown they are able to band together successfully in their own interest. Inpatient self-government is a gratifying actuality in many hospitals, and ex-patient clubs are increasing in number and variety throughout the country. In ex-patient clubs, former patients have an opportunity to participate in many group activities and in this way gain assurance and confidence in social situations. Club membership may be a steppingstone to developing more secure community roots and thus may play an important role in prevention of relapse.

Outpatient therapy. Therapy for outpatients is a growing service that proves invaluable to many ex-patients who need group work, long-term supportive or analytic therapy, or who require a course of pharmacotherapy or electric shock treatments. Therapy for the outpatient constitutes a major bulwark of support as well as a defense against rehospitalization.

Community adjustment becomes a natural and easy consequence of these graduated transitional steps back to society. The patient will need considerable support to withstand the stresses and slights felt in interaction with other citizens. Finding a job is often a problem because of the stigma attached to mental illness, and acceptance in the family or social group at times may be achieved only through an uphill fight. Here continued interest and support from the hospital is essential, and in some instances counseling and home visits by a trained

worker can be helpful. Often family members may be encouraged to seek psychiatric help themselves, for a patient's breakdown in many instances can be assumed to be part of a psychopathological family atmosphere. Finally, the hospital has a responsibility of educating citizens in general in problems of mental health and of cultivating good will toward both patients and ex-patients.

What outcome may reasonably be expected under good conditions of care and treatment? Although studies are still inadequate, the expectation is that of 100 acute cases admitted to an active treatment hospital, 80 to 85 will return to the community at various levels of improve-

ment within a few months. Recent followup studies from the Massachusetts Mental Health Center show that 75 percent of male ex-patients are working full time 1 to 2 years after hospitalization. Their earnings at the time of followup equal their pre-illness levels. We know that the lives of ex-patients are often quite impoverished in the social sphere, but we do not yet have systematic data to support this knowledge. While relapses may occur in about 25 to 30 percent of ex-patients, these are often of brief duration. At 5-year followup, more than 80 percent are in the community, and roughly half of the original number have not returned to any institution for psychiatric care.

Employment for the Mentally Handicapped

An estimated 3,600 persons who had mental handicaps were placed in jobs through the State-Federal vocational rehabilitation program during the year ending June 30, 1956. These placements, 28 percent above those in 1955, included many who had not previously been employed. About 2,800 had been mentally ill, and about 800 are mentally retarded. They are among a record total of 66,273 disabled persons restored to productive lives in the public rehabilitation program in fiscal 1956.

The Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, awarded about \$3.2 million in support of 245 rehabilitation projects during the year, in addition to the \$30 million granted for basic support of State rehabilitation programs.

Nearly 10 percent of the projects were concerned with rehabilitation of the mentally disturbed and deficient, representing a Federal investment of about \$400,000.

Projects for rehabilitation of the mentally ill are operating in Connecticut, Massachusetts, New Hampshire, Vermont, New York, Pennsylvania, Tennessee, Kansas, South Dakota, Nebraska, California, and Puerto Rico. Projects for the mentally retarded are carried on in Maine, Vermont, Connecticut, New York, New Jersey, Florida, Wisconsin, Illinois, Texas, and Colorado.



The Road Forward



Motoring with friends before taking his Navy induction physical, a 22-year-old Wyoming oil rigger drove his car off a high bridge. The result: He is paralyzed from the chest down for life. But the story only begins there. At the Woodrow Wilson Rehabilitation Center, Fishersville, Va., doctor, psychologist, therapist, guidance expert, and rehabilitation counselor combined their observations into a vocational diagnosis and prognosis and contributed to respective phases of his therapy and training. After months at the center, he is able to make his way as an electrical appliance repairman. He looks forward to an independent, self-supporting life.



A doctor explains to the patient the significance of his injury, shown on an X-ray film. He also advises on physical abilities and limitations and discusses types of work the young man may do.



As part of the vocational diagnosis, a psychologist tests aptitudes, intelligence, and interests.



An instructor at the center teaches the young man how to repair electric appliances of all types.



A physical therapist helps the young man develop the strength he will need to walk with crutches and long braces. He will work from a wheelchair, but exercise in an erect position is essential.



A rehabilitation counselor visits the boy at his new job and talks with his employer to assure that both are satisfied and to iron out any difficulties that may have arisen in the performance of his work.

Vector Control in the United States

A VECTOR, according to Webster's unabridged dictionary, is "an organism, usually an insect, which carries and transmits disease-causing micro-organisms." This is the classic definition of a vector. Since living languages are constantly changing in vocabulary and in word definitions, it is probably only a matter of time before dictionaries will begin to include broader and supplementary usages of the term "vector," consistent with current usage of the word. It is our purpose to define what "vector control" means today and to review the justification for modern vector control as carried on in this country.

Less than 30 years ago, as many as a million cases of malaria annually were estimated to have occurred in the United States, principally in the southern States. As many as a hundred thousand cases annually were attributed to each of several States. While malaria was undoubt-

edly the leading vectorborne disease, the aggregate incidence of other vectorborne diseases was very high by present-day standards, especially that portion of the dysenteries and diarrheas which is transmitted by houseflies to infants. At the same time, personal services and physical resources available to combat these diseases were negligible in relation to their extent and magnitude.

As recently as 1929 in one State with 100,000 cases of malaria, only one engineer was actively engaged in malaria control, giving part-time service to State and local health departments. It was not only natural but indeed essential under this setting for vector control to be conducted as a highly species-selective sanitation operation, at least in its malaria control aspect.

Such conditions still prevail in many parts of the world. Even though no method of control is completely species selective, focalization of effort against the production and resting places of the vector species, especially of the infected individual specimens, permits this objective to be substantially realized. Moreover, even in the United States, species-selective sanitation is still applicable today for the control and eradication of the yellow fever and dengue vector, *Aedes aegypti*.

All methods of vector control fall within the classic definition of sanitation. Irrespective of whether it is achieved by chemical, physical, biological, or other means, vector control involves the modification of man's environment in the interest of human health and well-being. However, because of the foregoing historic precedents, vector control in the professional and administrative mind has assumed a more selective position than other sanitation methods. Aside from certain special types of public water supply problems employing chlorination as a sole method of treatment, all other commonly employed sanitation measures have broader

The Committee on Vector Control, Engineering and Sanitation Section, American Public Health Association, presents this fifth annual report in full awareness that imposed limitations on length have prevented giving adequate attention to all aspects of the scope of vector control. Hence, attention has been concentrated largely on the scope and program complexities of mosquito control to the neglect not only of many other important vector species but also of source control aspects, especially in mosquito and fly control. Coverage of these aspects in turn would have more adequately exposed to fuller view the scope of vector control programs from a standpoint of agricultural, industrial, and community relationships. Members of the 1956 committee were John M. Henderson, C.E., chairman, George Bradley, Ph.D., Francis E. Gartrell, D.P.H., Wesley E. Gilbertson, M.S.P.H., Harold Gray, M.S., Ralph S. Howard, Jr., M.S., John A. Mulrennan, B.S.A., Theodore A. Olson, M.A., Richard F. Peters, B.S., and Fred H. Stutz.

purposes and benefits than the direct interruption of disease transmission. By the same token, sanitation in general prevents as well as controls disease incidence. In contrast with this philosophy of multipurpose benefit, vector control concepts have followed more closely the philosophy of the case-finding epidemiologist who pinpoints his efforts on the investigation and control of individual disease outbreaks during or following their occurrence.

Evolving Concept of Vector Problems

The attitude of the public toward vector control, however, almost invariably has been in accord with professional concepts of general sanitation. Sewage nuisances are not to be tolerated, not alone because of specific disease potentialities, but because they are obnoxious to the general enjoyment of life. Water should be treated not alone to remove infectious microorganisms, but to make it socially and economically usable and acceptable in other respects. All insects which bite man in numbers are undesirable and should be done away with at public expense when they constitute a public nuisance.

Illustrative of this prevailing attitude, even in certain underdeveloped areas where malaria is a primary socioeconomic problem, was the great early popularity of DDT residual spraying—not primarily because the spraying controlled malaria or reduced enteric diseases, but because houseflies no longer bothered people. Conversely, the subsequent development of resistance by houseflies to DDT has hampered the execution of malaria control programs in some of these areas.

In recent years, thinking in professional public health circles has begun to come abreast of the lay attitude toward sanitation. Explicit in the Constitution of the World Health Organization is the statement:

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

In harmony with this "positive health" concept and directly applicable to vector control is the following policy statement of the Acting Surgeon General of the Public Health Service in 1950 (1):

"It is our conviction that pest mosquitoes should receive more attention from health authorities than they have in the past. Public health has become something more than the absence of disease. Physical efficiency and comfort, on which mental equanimity depends to a substantial degree, may be seriously disturbed by the continued annoyance of pestiferous mosquitoes which may or may not have disease transmitting potentialities."

The Tennessee Valley Authority, long noted for its comprehensive and effective programs for control of the malaria vector, *Anopheles quadrimaculatus*, on its impoundages, has recognized the importance of controlling other species as well. In the spring of 1956, TVA's policy was amended to include control "of these other mosquitoes when their production in TVA waters constitutes a nuisance to sizable population groups or hazard to the public health."

Of current interest also is the frank recognition by the Public Health Service, its parent department, and the Congress that, in effect, not only is air pollution more than a communicable disease problem or even a respiratory illness problem, but a detriment to positive health and to general socioeconomic well-being. Accordingly, the Air Pollution Control Act (P. L. 159, 84th Cong.), which is administered by the Public Health Service under the supervision and direction of the Secretary of Health, Education, and Welfare, does not restrict the program of research and technical assistance to classic disease control aspects, but rather to this public problem as an entity.

As stated by Dr. Justin M. Andrews of the Public Health Service (2): "This is a very broad act which recognizes that air pollution may endanger health and welfare, injure agricultural crops and livestock, damage property, and create hazards to air and ground transportation. Thus, it is not limited to health in its implementing provisions." There is evidence of a similar breadth of approach to the air pollution problem on the part of affected State and local health departments, consistent with the sanitation tradition.

The air pollution problem in many respects is considered analogous to certain current vector problems in the United States. The severe

invasion of the city of St. Petersburg, Fla., and adjacent recreational areas by salt marsh mosquitoes in 1956, for example, may be compared with a severe smog episode in the city of Los Angeles. Smog episodes in Los Angeles are usually accompanied by numerous cases of eye irritation and discomfort. In St. Petersburg, there were reports of many cases of severe dermatitis requiring medical attention, especially among young children and infants.

In both cities specific disease transmission attributable to the respective environmental episodes was apparently absent. But the dislocation of community functions was pronounced, and there were clear-cut adverse effects on positive health, recreational activities, and mental equanimity. An aggravation of certain morbid conditions can be attributed in varying degrees to the episodes.

Vector problems in this country today may be broadly classified into three principal categories: (a) classic vectors which are responsible for the transmission of infectious disease at the present time, (b) species which possess public health and general socioeconomic importance as public nuisance problems, and (c) classic vectors which were responsible for the transmission of infectious disease in the past, but not at present. This classification is not clear cut since classic vectors in both categories may be public nuisance problems as well, depending on time and place. Conversely, nearly all the important species of mosquitoes which are commonly considered in this country as being primarily nuisance problems have either been incriminated in disease transmission at some time or place or have been proved experimentally to be capable of transmitting disease.

The chief vectors in the United States in the first category today are the housefly in areas where there is still a significant incidence of flyborne enteric infections, and those mosquito species which in various parts of the country are principal vectors of the encephalitides. Chief among these is the mosquito species *Culex tarsalis* widely distributed in the western irrigated States, especially in California. *Culex quinquefasciatus*, predominantly a nuisance species in most parts of the United States, is also a major vector of encephalitis in Texas.

The nuisance category comprises a large number of species which, individually or in small groups, present major problems in individual localities or larger areas. It is this group which today constitutes the basis for the enlarged definition of the term "vector." The group encompasses those insects and other animals which may adversely affect to an important degree the health objectives which are explicit or implicit in the WHO's and the Surgeon General's pronouncements. The importance of these problems has been adequately described and emphasized by the resolutions which were passed in 1955 and 1956 by the Association of State and Territorial Health Officers, the American Public Health Association, and several other more specialized bodies.

We prefer to see the justification for the control of such species presented on the clear-cut issue of their actual, well-established interference with man's interests. Irrespective of whether they do or do not constitute public health problems from everyone's point of view, we maintain that the control of these mosquitoes at public expense whenever they become primary public nuisances is warranted and indeed, often essential, to community existence. We further consider that local health and health-related agencies are the logical instrumentalities for carrying on such control measures. But to do so some of the agencies must manifest a greater interest in the needs and desires of the community pertaining to insect control as well as furnish the leadership and the guidance that the community needs and has a right to expect.

Uninterrupted technical service and research by State and Federal health agencies and other organizations is sorely needed to complement local action programs. We believe it to be more in the public interest to spend money for the control of such species than for the routine control of classic vectors which in the historic past have been responsible for disease in this country but no longer are, unless these historic vectors now constitute a significant nuisance problem. Apropos of this position, we quote another statement by Dr. Andrews, this time in reference to the mosquitoes of the far north (3).

"But whether these creatures spread disease

from lower animals to man, or from man to man, or whether they have nothing whatever to do with spreading disease, their overpowering numbers and vicious biting habits make insect control an almost necessary prelude to land development. To imply that they are unimportant from a health standpoint simply because they are not known to transmit infections organisms is to discredit the basic tenet of the World Health Organization Charter. Thus, insect control becomes an essential function of health organizations in bringing about relief from severe insect pestiferousness."

However, for those whose interest in mosquitoes is limited to the classic approach, we call attention to the fact that knowledge of the etiology and public health significance of mosquito-borne viruses is in an embryonic and dynamic stage. Indicative of this is the recent isolation of 31 different unknown mosquito-borne viruses in a single year by a single laboratory in South America. These viruses were obtained from seven different genera of mosquitoes (4). We note further that many of the more important species of so-called nuisance mosquitoes in this country have been found naturally infected with one or more strains of encephalitis virus.

Practical Aspects of Vector Control

From the standpoint of a control program, the intimate interrelationship between vectors and nuisance species in this country today is often imperfectly understood. A prime example is provided by *Aedes nigromaculis* and *C. tarsalis* in California. *A. nigromaculis* is the principal nuisance species. *C. tarsalis* is the principal vector of encephalitis and a secondary nuisance problem. Neither species is controllable by DDT residual house spraying. Both species are mainly found in irrigated areas in California. About \$3.4 million are locally appropriated each year in that State for mosquito control work performed by organized mosquito control districts or related organizational groups in local health departments.

Mosquito production through irrigation projects is a manmade problem. The basic method of control, therefore, is prevention and applies in large measure to both vector and

nuisance species. Employment of recommended irrigation practices is in the joint interest of soil and water conservation, higher crop production, and avoidance of mosquito production. Permanent eliminative measures of recurrent control by larviciding tend to control vector and nuisance species, but in varying degree, depending on the amount of selectivity practiced. However, because of various factors, including differences in length of cycle from ovum to imago and preferences in microhabitat by the ovipositing female, it is possible to carry on species control measures which will suppress *C. tarsalis* considerably more effectively than *A. nigromaculis*. Such a program could be conducted at somewhat less expense than the present one.

If, as might be advocated by the public health purist, mosquito control forces were directed toward controlling only the classic vector insofar as possible, the following consequences could logically be expected: (a) abandonment or drastic curtailment of organized local mosquito activities since it is well established that public support for local mosquito control appropriations in California is mainly motivated by the desire for freedom from discomfort; and (b) a tendency to emphasize more highly selective palliative measures at the expense of species-comprehensive preventive measures.

One theoretical alternative would be the establishment of two mosquito control organizations in each local area: one to control classic vectors and one to control other mosquito species. Technical services and financial aid to local areas by the State, similarly, would be furnished by two separate State departments, each functioning in its own compartment.

The impracticality of either plan, we believe, is so obvious that the issue should not be labored further. But we wish to point out that the California program of controlling all mosquito species which constitute a public nuisance not only satisfies the public interest and results in economy in government, but also makes possible the provision of local organizations and funds which otherwise would not be available for controlling the classic vector. Accordingly, classic vector control objectives are directly served by nuisance mosquito control. Conversely, in other situations nuisance control

interests have been and continue to be served by programs for the control of classic vectors.

Curiously, workers in certain quarters either have accepted or are believed to be readily capable of accepting the logic that local health departments should carry on comprehensive mosquito control but that supportive services by State and Federal health departments should be totally or almost entirely restricted to "classic vectors." This is in contrast, for example, with the position of the Florida Legislature which considers that all of the more important nuisance arthropods are of public health concern. This legislature has directly charged the Florida State Board of Health with the administration of a large State subvention appropriation for comprehensive control by local agencies and with a concomitant program of direct research and technical supervision.

Since California has been selected as offering an example of the integral relationship between classic vectors and nuisance species from a control standpoint, State agency supportive service in that State might well be reviewed. Such supportive service includes a modest State subvention appropriation to local mosquito control agencies for the principal purpose of augmenting control of the classic vector. However, because of the interrelationship between the production of the various mosquito species, it is not possible to spend these subvention funds in a manner which insures their exclusive application to *C. tarsalis*. Of more significance from a policy standpoint is the fact that most of the local mosquito control agencies in California look to the State department of public health chiefly for technical information and other service on new or improved methods of controlling problem mosquitoes, irrespective of their particular vectorial status.

Toward the discharge of this function, the health department, through its bureau of vector control, carries on certain investigations of control operations and research activities. The control of *A. nigromaculis* is more difficult than that of *C. tarsalis*, and it is also a problem of even greater magnitude. Hence, it is the position of local agencies and the bureau that enhancement of the adequacy of control of *C.*

tarsalis by local operating agencies can be brought about as expeditiously, and often more readily, by the development of new and improved methods of controlling *A. nigromaculis*, as by similar progress toward the direct control of *C. tarsalis*. Yet such activities by State and Federal agencies are not uncommonly considered inappropriate, at least by the very effective action of opposing appropriations for their prosecution.

As traditionalists in public health administration, the committee members consider that the first responsibility of State and Federal health agencies is to support local health agencies by research in needed fields and in such other manner as may be appropriate. They consider that the scope of such support should be established by the actual programs and needs of local health agencies since these yardsticks provide a more reliable measure of public needs and interests than any other.

Last, we wish to offer the afore-described enigma as further evidence of the error of arbitrarily compartmentalizing the components of any sanitation system into so-called public health and nonpublic health categories or into major and irrelevant categories. We consider it infeasible, for example, in the United States today under prevailing health and socioeconomic conditions to draw a sharp distinction in the sanitation of food-handling establishments between infectious dirt and noninfectious dirt, the proper objective rather being a clean establishment and "sanitation as a way of life." The same principle extends into all fields of sanitation, including air pollution, water quality control, housing, and last, but not least, vector control.

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Sanitation Survey in Vicksburg

VARDAMAN T. HAWKINS, B.A.

WITHIN the city limits of Vicksburg, Miss., in the tenement sections, on the main streets, and even in some of the fine residential districts, hundreds of tenants have been using community toilets or chilly privies located in central areas in the yards. The sanitarians of the Warren County Health Department have found and are still finding from 1 to 9 families using one toilet. In many areas where sewer lines have been available for from 1 month to 49 years, pit privies constructed during WPA days have been in use.

After checking on daily complaints of such conditions for several years, the health department sanitarians had reason to believe that their city with a population of 37,000 was in great need of a sanitation survey.

In January 1955 we met with the mayor and board of aldermen and outlined the existing conditions and the remedies we believed necessary for wholesale correction. We discussed the need for a new sanitation ordinance that would cover in specific detail most of the existing insanitary conditions or circumstances. After the presentation, the mayor and board asked us to write a new ordinance and present it to the city attorney for his approval.

The ordinance was approved July 7, 1955, and the health officer and sanitarians conferred on enforcement methods.

Survey Methods

From the engineering department, we obtained sectional maps showing all city sewer lines and had them enlarged about four times to allow sufficient space for identifying each residence or place of business and indicating the status of the sanitary facilities. The map

sections are numbered 1 through 16, with each number corresponding to the area covered on the city sewer map. For accessibility they are mounted on shade rollers and kept in a map case.

Spot checking the property and plotting it on the maps were sure to take time, but we considered thoroughness essential. As property is surveyed by automobile and jeep as well as on foot, it is earmarked on the map with a stamp divided into three sectors and a rectangular block. The first sector represents either city sewerage connections, septic tank, or pit privy; the second, city water; and the third, properly screened doors and windows. The property number is entered in the block and the house number underneath. A property card, bearing a corresponding number, is prepared for coding as to type of facility and filed by streets (see chart).

We then inspect the property to determine if correction is needed. Until completion of the inspection the insignia on the map is white. If inspection shows that the facilities are connected to the city sewerage and water systems and are properly screened, the three sectors are shaded green. If no sewerage line is available and a properly installed septic tank is in use, the first sector is shaded orange and the other two sectors green. Where no sewage facilities or septic tank can be installed and a pit privy meeting health standards is available, the first sector is shaded red and the other two green.

Mr. Hawkins, sanitation supervisor of the Warren County Health Department, Vicksburg, Miss., presented this paper at the annual meeting of the sanitarians of the Mississippi State Board of Health in Jackson, Miss., in December 1956.

Purple in the rectangular block carrying the property number indicates that the health department has ordered corrections.

With these different colors or shades we are able to picture the sanitary facilities and at the same time the health department's activity and progress.

Following inspection, a form letter is used to advise owners of conditions, corrections needed, and the time granted for compliance. The length of the compliance period is governed by several factors: size of job, number of installations to be made, and the circumstances under which work must be performed. Under ordinary conditions, 30 days is granted for corrective measures. On property held by heirs, the time may run from 30 days to 6 months.

Our first plan of action was to clear each area successively of all violations. We decided after several weeks, however, that corrective action would be speeded if we covered many areas in the city at once. This procedure helped spread the news of work that must be done, and the results were beyond our expectations. In many places we found new facilities installed in anticipation of the inspection.

The number of notices sent out at a given time depends on such circumstances as weather, plumber workload, and number of installations by any individual owner. Many owners have contracted for installations which cannot be completed within the time granted. In such circumstances we note on a copy of the form letters that work is in progress and a new date for completion is set. The notices are checked from day to day and premises are reinspected when necessary to determine compliance. When no action has been taken toward installation, the occupants, owner, or agents are asked to explain the delay. If the explanations are reasonable, more time is granted.

We have found that the people are understanding and fundamentally cooperative. Generally, we have needed only to stimulate civic pride and thereby obtain corrective results. However, if no effort has been made to remedy facilities, we grant only a minimum of additional time for starting the job, usually from 5 to 10 days. When no work is done by the ex-

piration of this new time, court action is taken. We have had to resort to the courts in only 31 cases, representing about 4 percent of the 771 sewer connections installed as of June 20, 1957. None of these court cases have been lost or appealed.

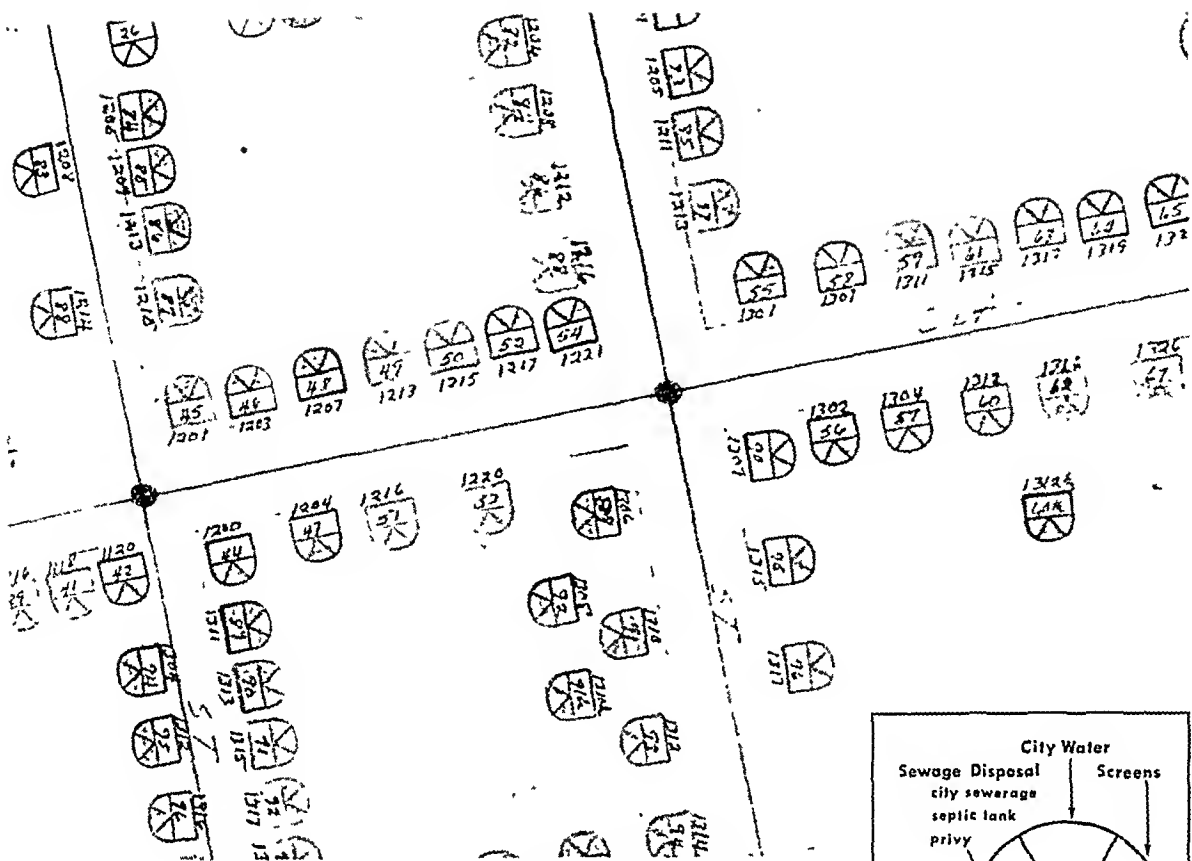
The sanitation survey revealed that no sewer lines were available in many heavily populated areas in the city. We asked the residents on these streets and in these areas to draw up petitions requesting the mayor and board of aldermen to extend lines to their property. The health department has followed such petitions with facts, figures, and recommendations that they be granted. We are justly proud of the response that our city fathers have given this phase of the survey. Sewer connections have been installed on 30 additional streets and areas, comprising 426 homes that may now employ indoor sanitary flush toilets rather than the pit toilets previously used. Unfortunately, in some areas in the city, sewer lines cannot be laid because the topography prevents gravity flow. We expect that this survey will bring about the installation of several lift stations to accommodate several of these areas.

If we had to suggest a first step in slum clearance in any city we should recommend a sanitation survey. In the city of Vicksburg we have encouraged as many as 32 bathroom installations in one neighborhood. Before this survey these 32 families were using 8 outside obsolete frostproof toilets located in a central yard. At the same time, these 32 homes have been given gas connections, kitchen sinks, and structural repairs. In fact, repairs, installations, and cleanups have completely changed the appearance of some neighborhoods.

The effect of the improvements has been to increase the value of property, to improve living conditions, and, above all, to replace a hazardous environment with a relatively clean one.

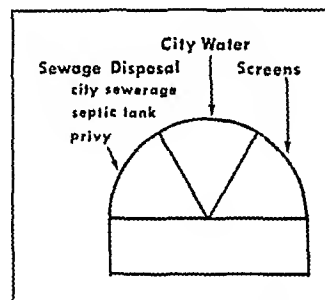
Effective Ordinance

The success of this sanitation survey can be attributed first to the desire of people to move forward; second, to a just and unbiased court; and third, to a good sanitation ordinance. People must have leadership to move forward under any circumstances. We as



Part of sectional map used in Vicksburg sanitation survey.

Inset. Inspection data stamp.



sanitarians have tried to supply that leadership by gaining and holding the confidence of the residents we serve. This confidence has been well demonstrated by the fact that 96 percent have complied with our instructions. Many conferences were held with the noncompliers before court action was brought. In these conferences we pointed out the many problems encountered by other property owners in like circumstances.

In all activities in the survey, we have tried to be fair and impartial. This has been our greatest asset in the courts. Even when we have been compelled to resort to court action, much good has been derived apart from the judge's decision. There is more respect for the health department than ever before. This we consider a long-term gain.

A third asset has been the sanitation ordinance, which we believe is equal to any situation

that may arise in a sanitation survey. Three sections in particular have been helpful. Section 4 requires that each residence or place of business within the city of Vicksburg shall be provided with a sanitary flush toilet and that this toilet must be located in the dwelling or in a room attached to the dwelling. In other words, no more outside community or yard toilets are allowed. The city has many outside facilities, but as major repairs are needed these toilets will be condemned and owners will be notified to make installations inside. This will gradually eliminate all outside systems where the sanitary sewer lines are available.

In areas where sewers are not available, section 5 requires that owners install a septic tank and field line if the lot size will permit an installation that meets the minimum requirements of the Federal Housing Administration. Provisions have been worked out between the

city and the health department whereby the health department supervises all septic tank installations within the city. Permits are not granted or issued to proposed builders until the health department is consulted. Where sewer lines are not present and lots are not suitable or adequate for septic tank construction, section 6 allows a properly constructed pit privy meeting Mississippi State Board of Health standards. In instances in which the outdoor privy is the only practicable facility, we encourage its maintenance in a condition that will not be hazardous to health.

Since the beginning of the survey, Vicksburg has voted bonds in the amount of \$800,000 for the extension of 38 miles of new sewer lines. We feel that this is another direct result of the sanitation survey. This new system of sewers should be ready for use by October 1957. The inspections have already been made in this new area. When the sewer is completed, 653 known septic tanks and 61 pit privies will

be eliminated. Many lots and building sites will be made available for buildings which would never have been suitable without the sewer extension since these lots are too small for septic tank installation.

Accomplishments

To summarize briefly the accomplishments of the Vicksburg sanitation survey, 7,165 homes and establishments have been surveyed or inspected; 771 sewer and 881 water connections have been made; 255 septic tanks and 21 new pit toilets have been installed. Repairs to 102 flush toilets and 35 pit toilets have restored them to approved standards. The door or window screens, or both, that have been added to 605 homes and establishments prevent the entrance of insects. And new sewer lines have been installed on 30 additional streets or areas, providing sewer connections for 426 additional homes.

1957-58 Training Grants

Grants and awards totaling almost \$2 million for the training of public health specialists in the 1957-58 academic year have been announced by the Public Health Service.

Slightly more than half of the funds were awarded to 230 persons, including physicians, engineers, health educators, laboratory workers, dentists, and others who will enter colleges and universities this fall for a year of graduate public health training.

The balance went to 44 colleges and universities offering programs of study in public health nursing and to 11 schools of public health. These 55 schools will select trainees to benefit to the extent of 252 man-years of instruction: approximately 250-300 nurses and 70 other professional health personnel are expected to receive awards from the grantee institutions.

This is the second year that public health training funds have been available from the Federal Government. In 1956-57, with a \$1 million appropriation, the traineeship program provided training for 363 public health workers. More than 600 individuals are likely to be assisted this year.

In selecting trainees, consideration is given to the personnel shortage in the candidate's field, the age of the candidate, his training and experience, and other factors which will increase the supply of young, well-trained workers.

Progress in Reporting Mental Hospital Statistics

*Seventh Annual Conference of
Mental Hospital Statisticians,
Washington, D.C., May 8-10, 1957*

THE NEED for more specific annual and monthly data on the movement of the patient population of mental hospitals, interstate comparisons of cohort studies, and reevaluation of basic definitions of terms applying to patient movement were major topics at the Seventh Annual Conference of Mental Hospital Statisticians. The conference, held at Washington, D. C., May 8-10, 1957, was sponsored by the National Institute of Mental Health, National Institutes of Health, Public Health Service. Delegates from 17 of the 18 member States of the Model Reporting Area for Mental Hospital Statistics attended (see box inset).

In addition, unofficial observers from Connecticut, Delaware, District of Columbia, Kentucky, Massachusetts, North Dakota, Tennessee, and the Veterans Administration were present. Other guests represented the Joint Commission on Mental Illness and Health, the American Psychiatric Association, the Bureau of Prisons, Department of Justice, and the Dominion of Canada and two of its Provinces.

In reviewing the work of the Model Reporting Area since its inception in 1951, Dr. Morton Kramer, chief, Biometrics Branch, National Institute of Mental Health, mentioned as major accomplishments the progress made toward standardization of definitions and the development of the cohort approach to the study of the

population dynamics of mental hospitals. The quality and scope of the studies carried out during the past year would not have been possible without the close cooperation which exists among members of the Model Reporting Area. (For a short account of the establishment and objectives, see *Public Health Reports*, October 1956, p. 1033.)

Cohort Studies

A cohort study committee was appointed by the sixth conference to review data submitted in a uniform manner by member States and to make recommendations regarding further refinements of these studies and plans for publication. The findings of this committee, based on data submitted by 11 States during the year, were reported at the meeting.

These data showed proportions of patients released from, dying in, or retained in, public mental hospitals in each of the States within the first 12 months following admission. Considerable variation among States was found for each category. The committee listed a number of factors which might account for these differences, such as screening facilities in the community, legal requirements, administrative policy, type of patient admitted, and severity of illness.

In an attempt to achieve greater comparability among the States, the committee recommended that, in the future, groups of patients should be tabulated and studied separately ac-

This report was prepared by the Hospital Studies Section, Biometrics Branch, National Institute of Mental Health, Public Health Service, Bethesda, Md.

cording to type of commitment and location of patient immediately prior to admission. It was also proposed that, since patients may be released for nonmedical reasons, such releases be tabulated according to whether the patients were released to the community or to another hospital outside the State system and whether released with or against medical advice.

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Noting the wide variation among States in release, death, and retention rates, the committee felt that the States should be protected against invalid interpretations. Therefore, considerable discussion was given to the problem of whether the States should be identified by

name in a publication of this type. There is a real danger that these data, so identified, could be interpreted in various ways by various individuals depending upon the uses to be made of them. However, it is the responsibility of each of the States which submitted cohort data to furnish for publication the best possible explanation of the limitations of its data. There was a feeling expressed by some of the group that real understanding of differences between States in the probabilities of release, death, and retention cannot be obtained unless the States are properly identified.

Seven of the member States are conducting cohort studies of patients first admitted to their mental hospital systems on a continuing basis. Studies have also been begun in some States in which cohorts of patients who have been resident in the hospital for specified lengths of time are followed for a period subsequent to a given date. Some States are also beginning cohort studies of released patients to determine probabilities of return to the hospital for specified lengths of time after release. These studies will provide more precise data than those provided by the use of discharge rates in which the number of discharges during a year was related to the number of patients under treatment or to some other measure of the number of patients exposed to the risk of discharge.

Basic Definitions

One of the original aims of the Model Reporting Area was to develop a set of definitions of mental hospital population movement terms which could be uniformly applied in national reporting. It was believed that this would constitute a great step forward in achieving interstate comparability of mental hospital data. Such definitions were developed and adopted at earlier meetings of this group.

Since these definitions were developed to remove the effect of interstate variations in practices and policies, they are, of necessity, compromise definitions. At the 1957 meeting, therefore, the experiences of the States in the use of these definitions were reviewed in order to determine whether the definitions are achieving the goal for which they were established.

In group discussions the conference reviewed

Model Reporting Area States

Representatives from the following States are members of the Model Reporting Area for Mental Hospital Statistics.

| | | |
|------------|------------|--------------|
| Arkansas | Michigan | Oklahoma |
| California | Minnesota | Pennsylvania |
| Illinois | Nebraska | Texas |
| Indiana | New Jersey | Virginia |
| Kansas | New York | Washington |
| Louisiana | Ohio | Wisconsin |

the definitions of resident patient, first admission, transfer, and certain special categories of care, such as family care, day care, and night care. The following points represent the consensus of the conference:

1. The definitions in their present form are not entirely satisfactory because they are difficult to apply in some cases; there are minor inconsistencies; and they are not available in one publication for ready reference.

2. A standing committee on definitions should be established to reexamine existing definitions and recommend new ones.

3. Until recommendations of this committee have been adopted the present definitions should be adhered to for national reporting.

A committee on definitions was appointed. It will meet during the year and will submit a report to the next annual conference. One of the most valuable services of this committee will be to specify the purposes for which data, based on each definition, may be used and to indicate the specific limitations of such data.

Patient Movement Data

The number of resident patients at the end of fiscal year 1956 showed a decrease from the number at the beginning of the year. Since this was the second time in history that such a decrease occurred, many theories were advanced as to its cause. Foremost was the advent of the widespread use of the tranquilizing drugs. The existence of such theories, without supporting data, emphasizes the need for more detailed data on the movement of mental hospital populations. If data on number of admissions, releases, deaths, and resident patients at end of the year were available according to such factors as age, sex, mental disorder, and length of hospital stay, one should be able to determine more specifically the areas in which changes in the resident population are taking place.

The statistical reporting systems in several States will accommodate readily preparation of data of this type. The conference agreed that forms should be developed to obtain information on this detail and that the data should be distributed to the members of the Model Reporting Area on a trial basis.

Reporting of mental hospital population movement data on a monthly basis by Model Reporting Area States began in December 1956. The purpose of such reporting is twofold: to obtain data for administrative purposes on a highly current basis and to permit the isolation and removal of seasonality in studying trends in the movement of mental hospital populations. Tables based upon reports for the first 3 months had been distributed to the members of the area in advance of the meeting. There seemed to be considerable consistency among States in the direction of change of population movement from one month to the next. For example, of the 16 States reporting, all but 2 showed a decrease in number of resident patients during December 1956 while in all but 4, mental hospital populations increased during January and February 1957.

Sufficient data had not yet been collected to provide estimates of the seasonal factor. Therefore, plans were discussed for analysis and presentation of these monthly data once the second year of this collection has begun.

Mental Hospital Statistics in Canada

Four representatives from Canada attended this meeting, two from the Dominion Government and two from Provincial governments. Apparent from the description of the mental hospital statistics program which these delegates presented were the striking similarities in the problems facing the mental hospital statisticians in the two countries. Each has problems in obtaining prompt reports and using uniform definitions.

Each of the 10 Provinces of Canada reports to the national statistics office, but maintains its own mental hospital statistics system. This is essentially the same procedure which is carried out by the Model Reporting Area.

However, one fundamental difference in national reporting exists. In Canada individual patient data are submitted to the Dominion Government by each of the Provinces. In the United States, on the other hand, this is done only on a special study basis. As a routine, only certain specified tabulations are submitted to the National Institute of Mental Health.

cording to type of commitment and location of patient immediately prior to admission. It was also proposed that, since patients may be released for nonmedical reasons, such releases be tabulated according to whether the patients were released to the community or to another hospital outside the State system and whether released with or against medical advice.

The committee recommended that these cohort data be published. It proposed that such publication be primarily oriented toward pointing up problems in interstate comparisons and should include the following:

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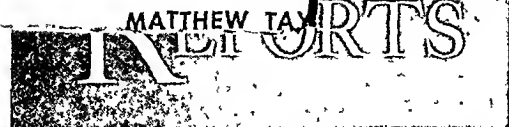
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frontispiece

The Public Health Service evaluates vaccines for safety, purity, and potency against influenza. The student inoculated here is participating in a potency study. (See page 861.)

This and future interchanges of ideas between the mental hospital statistics personnel of Canada and those of the United States will be of great mutual benefit to the two countries.

Other Problems

Plans are being formulated for collecting a certain amount of socioeconomic data on each patient admitted to mental hospitals during the period centered around 1960. Classifications closely paralleling those used by the Bureau of the Census will be adopted so that mental hospital data can be related to comparable data for the general population which will be obtained in the 1960 United States Census of Population. A similar collection of data for admissions to outpatient psychiatric clinics is being planned.

The need for more precise, sensitive, and useful statistical indexes of institutional operation was stressed. It was suggested that statistical quality control techniques might be applied to mental hospital data in such a way that the administrator would be provided with up-to-the-minute indications for courses of action based on the current and past operation of his program. A committee was appointed to study this problem.

The concern expressed at the Sixth Conference of Mental Hospital Statisticians regard-

ing the nomenclature for mental defectives was reemphasized. In view of the fact that several States had already developed their own statistical classifications of mental defectives, thus creating greater noncomparability, a resolution was passed urging the American Association on Mental Deficiency to take immediate action to develop a new nomenclature. It was further resolved that a date for such revision be publicized so that the introduction of other individual nomenclatures would be discouraged.

Regional Meetings

A report was given covering the proceedings of the Second Midwest Conference on Mental Health Statistics, held at Madison, Wis., on October 25-26, 1956. These meetings are a direct outgrowth of the annual conferences of mental hospital statisticians and are designed to focus on problems of interstate comparability of mental hospital data in the midwest.

A reporting system aimed at greater mutual understanding of the State mental hospital systems has been developed by this group. The emphasis of these reports is on the types of inpatient facilities for mental illness, the types of care provided by these facilities, and the types of admissions to these facilities. A similar meeting is being planned for October 1957.

Assistant Surgeon General for Personnel and Training

Otis L. Anderson, M.D., has been assigned to the newly created post of Assistant Surgeon General for Personnel and Training, Public Health Service. His previous duties as chief of the Service's Bureau of State Services will be assumed by **David E. Price, M.D.**, deputy chief of the Bureau of Medical Services since March 1957. The changes become effective October 1, 1957.

In his new position, Dr. Anderson will represent the Surgeon General in all matters relating to personnel and training. He will be responsible for the development, utilization, assignment, recruiting, and training of personnel.

Dr. Anderson has spent his entire professional career in the Service, following his graduation in

1929 from the College of Medicine, University of Nebraska. His duties have included medical practice and hospital administration.

Dr. Price, who also has spent all of his professional career in the Service, is a graduate of the University of California School of Medicine and of the Johns Hopkins School of Public Health. His early activities were in venereal disease control. In 1946, he was assigned to the newly established Research Grants Division, and in 1950 he was named associate director of the National Institutes of Health. Two years later he became Assistant Surgeon General in the Office of the Surgeon General.

Philippine Influenza Epidemic of 1957

MATTHEW TAYBACK, Sc.D., and ARTURO C. REYES, M.D., Dr.P.H.

This paper presents such data as it has been possible to assemble on the commencement of the influenza epidemic in the city of Manila, the time sequence of the outbreak, the nature of the resulting mortality, and an estimation of the attack rates. The information should assist in an appreciation of the epidemiology of Asian influenza, which during the first half of 1957 was reported in epidemic proportions in Hong Kong, Singapore, Taiwan, the Philippines, Japan, Australia, and India.

AN UNUSUAL increase in the incidence of reported cases of influenza in the city of Manila, Philippines, was apparent as early in 1957 as the week ending May 11, the 19th week (see chart). Evidence that influenza was present in epidemic proportions in the western Pacific area immediately prior to this time is available from intelligence reports gathered by the Singapore Epidemiological Intelligence Station. The information is in the files of the Western Pacific office of the World Health Organization. The earliest indication of epidemic influenza appears in the following abstract from a story in the *South China Morning Post*, Hong Kong, April 17, 1957:

EPIDEMIC IN CHINA—Arrivals in Hong Kong yesterday from Central China said that influenza has reached epidemic proportions in Shanghai, Nanking, Kuan, as well as Peking. Doctors, they added, were working overtime in hospitals and clinics treating patients. They said that as far as they know, no deaths from influenza have been reported. Chinese newspapers said that influenza was also spreading in other parts of China and as far north as Inner Mongolia, as well as southwards in Kwangsi and Kwangtung. Many cases, it was added, had already been reported in Canton.

The following statements in a subsequent report by the Singapore intelligence officer

dated May 20, 1957, appear pertinent to the introduction of influenza into the Philippines through Manila.

HONG KONG—Commencement . . . In 2d week of April 1957 rising to epidemic incidence in the 3d and 4th weeks of that month. Number of cases has been falling rapidly since then.

Total numbers affected are not obtainable with any degree of accuracy as the disease has not been notifiable; but as an estimate, not less than 10 percent of the population were affected. Absence of sick staff caused slight curtailment of transport services and some restriction of output from factories. Schools officially remained open.

Fatality rate was negligible.

TAIWAN—At the end of April 1957, many cases with symptoms of influenza appeared in the public hospitals and private clinics in Keelung City. In Taipei City, cases with symptoms of influenza appeared at the beginning of May.

No fatal cases have been proved.

SINGAPORE—As of May 9, the influenza epidemic has affected about 10 percent of the population.

It is reasonable to suppose that the onset of epidemic influenza in Manila was associated with the presence of this entity in Hong Kong and Taiwan, both of which are in frequent, if not daily, contact through commercial and passenger traffic with Manila. The existence of epidemic influenza in South China was a pos-

Dr. Tayback, assistant commissioner of health, Baltimore City Health Department, Maryland, is on assignment in the Philippines with the World Health Organization. He is visiting professor of biostatistics at the Institute of Hygiene, University of the Philippines. Dr. Reyes is professor of epidemiology at the Institute of Hygiene.

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Published concurrently with this issue:

PUBLIC HEALTH MONOGRAPH NO. 47 . . . Thermal inactivation of *Coxiella burnetii* and its relation to pasteurization of milk.

John B. Enright, Walter W. Sadler, and Robert C. Thomas

30 pages; illustrated. A summary and information on availability appear on pages 947-948.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSON, *Secretary*

PUBLIC HEALTH SERVICE
LEROY E. BURNEY, *Surgeon General*

Table 1. Reported number of deaths (all causes) and of influenza cases, Manila, 1957 and 1956

| Week No. | 1957 | | 1956 | |
|----------|------------------------|--------------------|------------------------|--------------------|
| | Deaths from all causes | Cases of influenza | Deaths from all causes | Cases of influenza |
| 1..... | 88 | 80 | 149 | 59 |
| 2..... | 143 | 77 | 111 | 84 |
| 3..... | 136 | 73 | 144 | 99 |
| 4..... | 146 | 101 | 133 | 68 |
| 5..... | 133 | 89 | 130 | 96 |
| 6..... | 134 | 87 | 128 | 79 |
| 7..... | 137 | 97 | 184 | 68 |
| 8..... | 137 | 95 | 139 | 71 |
| 9..... | 139 | 103 | 120 | 121 |
| 10..... | 157 | 79 | 148 | 100 |
| 11..... | 171 | 126 | 164 | 87 |
| 12..... | 152 | 55 | 154 | 131 |
| 13..... | 152 | 60 | 138 | 104 |
| 14..... | 150 | 77 | 159 | 100 |
| 15..... | 169 | 117 | 151 | 126 |
| 16..... | 156 | 81 | 188 | 181 |
| 17..... | 187 | 149 | 200 | 209 |
| 18..... | 167 | 128 | 147 | 109 |
| 19..... | 167 | 212 | 163 | 105 |
| 20..... | 364 | 1,215 | 185 | 124 |
| 21..... | 693 | 1,621 | 195 | 110 |
| 22..... | 569 | 1,244 | 154 | 133 |
| 23..... | 267 | 270 | 163 | 132 |
| 24..... | 139 | 122 | 202 | 125 |
| 25..... | 166 | 161 | 190 | 146 |
| 26..... | 150 | 56 | 205 | 182 |
| 27..... | 162 | 50 | 185 | 114 |

10 to 20 percent and in view of the high economic standing of the sample.

It was decided, therefore, to select a representative sample of the population in Manila and by household interview to obtain unbiased estimates of influenza attack rates. The existence of an ongoing sample survey program, the Philippine statistical survey of households, provided a frame from which we could choose a stratified systematic sample of households. Of the 159 households selected, 141 (88 percent) were successfully interviewed. Seventeen households could not be located, but substitutions were made for all except one by taking the unit closest to the scheduled household. The following data are based, therefore, on 158 household interviews.

The total number of individuals in the units interviewed was 1,144, an average of 7.2 per household. This is about the same size family as found in the student household survey (8.3) but, of course, much larger than the average in

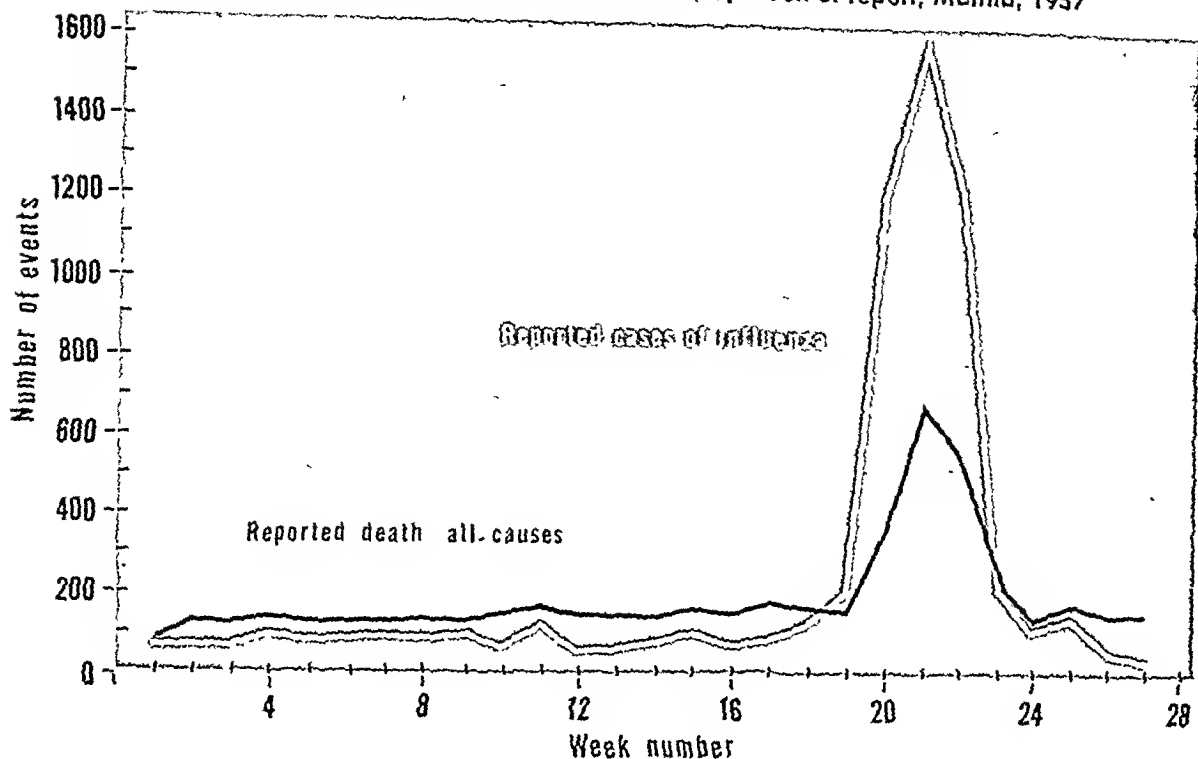
the United States and in most Western European countries. The distribution of the sample by age and the attack rates for influenza are shown in table 3. For all age groups, 70 percent of the individuals for whom a history was obtained were attacked by influenza. The attack rates do not vary significantly within the age range 1-14 years. However, there is evidence of decline in attack rates with age for individuals 15 years and older, although the attack rate for persons 45 years of age and over still exceeds 50 percent.

No noteworthy sex differences in attack rates were observed. The age trends noted above

Table 2. Influenza experience of 49 households, reported by students of the Institute of Hygiene, University of the Philippines, April-June 1957

| Age of household members (years) | Number persons at risk | Number attacked | Percent attacked |
|----------------------------------|------------------------|-----------------|------------------|
| Total | | | |
| All ages..... | 411 | 180 | 44 |
| Under 1.. | 15 | 6 | 40 |
| 1-4..... | 34 | 20 | 59 |
| 5-9..... | 40 | 21 | 53 |
| 10-14.... | 55 | 26 | 47 |
| 15-24.... | 101 | 44 | 44 |
| 25-44.... | 114 | 44 | 39 |
| 45 and over.. | 52 | 19 | 37 |
| Metropolitan Manila | | | |
| All ages..... | 112 | 47 | 42 |
| Under 1.. | 3 | 0 | 55 |
| 1-4..... | 8 | 6 | |
| 5-9..... | 9 | 5 | |
| 10-14.... | 8 | 2 | 41 |
| 15-24.... | 28 | 15 | 54 |
| 25-44.... | 41 | 14 | 31 |
| 45 and over.. | 15 | 5 | 33 |
| Rest of Philippines | | | |
| All ages..... | 299 | 133 | 44 |
| Under 1.. | 12 | 6 | 50 |
| 1-4..... | 26 | 14 | 51 |
| 5-9..... | 31 | 16 | 52 |
| 10-14.... | 17 | 21 | 51 |
| 15-24.... | 73 | 29 | 40 |
| 25-44.... | 73 | 30 | 41 |
| 45 and over.. | 37 | 11 | 38 |

Cases of influenza and deaths from all causes, by week of report, Manila, 1957



sible prelude to its introduction into Hong Kong.

Influenza is endemic in Manila. The weekly reported incidence ranged from 59 to 209 cases during the first half of 1956 and from 55 to 149 cases for the first 18 weeks of 1957 (table 1). In the week ending May 11, 212 cases were reported, a substantial rise from the weekly totals recorded prior to that time. By itself, this rise would have little significance, but in the following week the reported incidence was 1,215. It may be surmised, therefore, that epidemic influenza took hold during the week of May 11. Examination of the chart indicates that the influenza incidence returned to the endemic level during the week ending June 15, the 24th week. Epidemic influenza was present for a period of 5 weeks, with the preponderance of reported cases occurring within a period of 3 weeks.

Extent of Population Affected

The intelligence reports received and issued by the Singapore Epidemiological Intelligence Station were notably deficient in valid esti-

mates of the incidence of influenza during the epidemic intervals. The medical officer of Hong Kong reported that not less than 10 percent of the population was affected. The health authority of Singapore also reported an incidence in the area of about 10 percent. The city health officer of Manila based an estimate of incidence upon the experience of city employees and reached an impression of 20 percent.

Using a form for ascertaining household incidence of influenza during the second quarter of the year, originally proposed by Dr. Jacinto Dizon, chief of the section of epidemiology and vital statistics, Bureau of Health of the Philippines, we obtained an attack rate of 44 percent for members of the 49 households with which students at the Institute of Hygiene, University of the Philippines, were associated (table 2). Study of the factor of residence, rural versus urban, yielded no difference of note. Age variation in attack rates was evident, smaller frequencies being noted at older ages, but the small size and the extraordinary selectiveness of the sample indicated caution in analysis. The magnitude of the attack rate for all ages combined was surprising in view of previous estimates of

Table 5. Recorded mortality from all causes, Manila, January-May, 1957 and 1956

| Age (years) | January-April | | May | | 1957 1956 | Percent of population ¹ | Excess mortality | Excess mortality percent of population | Excess mor- tality per 100,000 estimated population ² |
|------------------|---------------|-------|-------|------|--------------|---------------------------------------|---------------------|---|--|
| | 1957 | 1956 | 1957 | 1956 | | | | | |
| All ages..... | 2,560 | 2,579 | 1,850 | 761 | 2.4 | 100.0 | 1,089 | 10.9 | 83.8 |
| 0-1..... | 962 | 939 | 519 | 277 | 1.9 | 3.9 | 242 | 62.1 | 477.3 |
| 1-4..... | 381 | 356 | 444 | 122 | 3.6 | 13.0 | 322 | 24.8 | 190.5 |
| 5-9..... | 73 | 91 | 154 | 20 | 7.7 | 15.0 | 134 | 8.9 | 68.7 |
| 10-14..... | 25 | 34 | 30 | 11 | 2.7 | 11.3 | 19 | 1.7 | 12.9 |
| 15-24..... | 103 | 103 | 68 | 33 | 2.1 | 21.3 | 35 | 1.6 | 12.6 |
| 25-44..... | 267 | 292 | 184 | 84 | 2.2 | 22.7 | 100 | 4.4 | 33.9 |
| 45-64..... | 339 | 365 | 193 | 97 | 2.0 | 9.9 | 96 | 9.7 | 74.6 |
| 65 and over..... | 410 | 399 | 258 | 117 | 2.2 | 2.9 | 141 | 48.6 | 374.0 |

¹ The percentage distribution of population for Manila is assumed to be equivalent to that given for the urban area as reported by the Philippine Statistical Survey of Households, series No. 2, vol. 1, Demographic and Socio-Economic Data.

² Population estimates for Manila are extremely difficult to judge with respect to reliability. An estimate by the Bureau of Health for July 1, 1955, was 1,250,000. The annual natural increase is approximately 35,000. The population used here was 1,300,000.

have been about the same in May 1957 as in May 1956. The actual number of deaths during these two months, however, was very different. For all ages combined, the mortality from all causes in May 1957 was more than twice (2.4) what would have been expected from the 1956 experience. The ratio varies with age, the greatest difference occurring among children 5-9 years of age. It should be added that these ratios represent an approximation to the rate of increase in the age-specific mortality rates.

Another way of looking at the data would be to consider the manner in which the various age groups contributed to the excess mortality. Since the intervals covered by the several age groups vary in size and include an unequal proportion of the population, the excess mortality (May 1957 minus May 1956) was related to the percentage of the population to obtain the index "excess mortality percent of population" (table 5). This index was selected because recent information of reasonable precision was available with respect to the percentage distribution of the population by age. For those who prefer to express this index per 100,000 population, an attempt was made to obtain such indexes by age, and these also are shown in the table. These figures may be interpreted as follows. For all ages an excess of 83.8 deaths from all causes per 100,000 population occurred during the epidemic of influenza in May. This rate of excess mortality varies from peaks of

477.3 among infants and 374 among persons 65 years of age and over to minimums of 12.9 and 12.6 for age groups 10-14 and 15-24.

A question which may arise is whether the excess mortality found in Manila in association with epidemic influenza of the Asian strain of virus was unique and peculiar to this city. The reports from Hong Kong, Singapore, and Taiwan indicated that the disease was mild and that fatalities were rare.

We have taken advantage of some papers on file in the Western Pacific office of the World Health Organization to explore this issue a bit further. In table 6 the trend in deaths from all causes and from tuberculosis is shown for Hong Kong for the first 5 months of 1957. During

Table 6. Average weekly number of deaths from all causes and from tuberculosis, Hong Kong, 1957

| Period | All causes | Tuberculosis |
|----------------------------------|------------|--------------|
| Dec. 30, 1956-Jan. 26, 1957..... | 338 | 47 |
| Jan. 27-Feb. 23..... | 466 | 63 |
| Feb. 24-Mar. 30..... | 394 | 57 |
| Mar. 31-Apr. 6..... | 352 | 61 |
| Apr. 7-13..... | 370 | 45 |
| Apr. 14-20..... | 543 | 82 |
| Apr. 21-27..... | 681 | 112 |
| Apr. 28-May 4..... | 506 | 85 |
| May 5-11..... | 454 | 79 |
| May 12-18..... | 382 | 61 |
| May 19-25..... | 387 | 73 |
| May 26-June 1..... | 361 | 54 |

Table 3. Influenza experience reported by a sample of 158 households in Manila, April-June 1957

| Age of household members (years) | Number persons at risk | Number attacked | Percent attacked |
|----------------------------------|------------------------|-----------------|------------------|
| All ages----- | 1, 144 | 796 | 70 |
| Under 1----- | 32 | 19 | 59 |
| 1-4----- | 133 | 104 | 78 |
| 5-9----- | 154 | 116 | 75 |
| 10-14----- | 130 | 102 | 78 |
| 15-24----- | 279 | 204 | 73 |
| 25-44----- | 289 | 184 | 64 |
| 45 and over----- | 127 | 67 | 53 |

prevailed among both sexes. A question of some importance is whether the proportion of the population affected was influenced by its density. We have found it possible to classify the sample households according to the average density reported for the area in which they were located. Three categories were formed: 50 or more inhabitants per square kilometer, 30-49 inhabitants, and less than 30. No significant difference in attack rates was found.

It is clear that the high attack rates reported for the small group of student households did not exaggerate the extent to which epidemic influenza affected the population of Manila, nor did it improperly indicate the general age trend in the attack experience.

Excess Mortality From All Causes

The severity of an influenza epidemic can be measured by the percentage of individuals who

require medical attention, the number of days lost from work, and probably by other indexes. However, there can be little question that the statistics relating to mortality provide a rational means of assessing the severity of the clinical entity which we call Asian influenza.

In Manila, all deaths occurring within the city are registered with the city health department. Deaths among nonresidents are not included in the monthly detailed mortality statistics. It is generally agreed by vital statisticians who have studied the registration system in Manila that registration of deaths is substantially complete. The effect of acute epidemic respiratory disease in terms of death is best measured by a consideration of the excess mortality from all causes which occurs simultaneously with the epidemic rather than in terms of deaths ascribed only to influenza or bronchopneumonia. The reason is that the extent of mortality from tuberculosis and cardiovascular disease can be markedly affected by the presence of influenza.

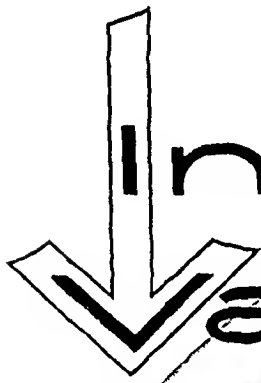
In table 4 the number of resident deaths for Manila is given by age group and by month for the first half of 1956 and of 1957. The number of deaths from all causes for all ages was very similar in 1956 and 1957 except in May, the peak month of reported influenza cases. In table 5, the number of deaths for each age group is shown for the first 4 months of 1957 and of 1956. The correspondence of the figures for the 2 years is remarkable. It is reasonable to expect that, in the absence of unusual circumstances, the number of deaths from all causes and their distribution by age would

Table 4. Number of deaths, by age and month of occurrence, Manila, 1957 and 1956

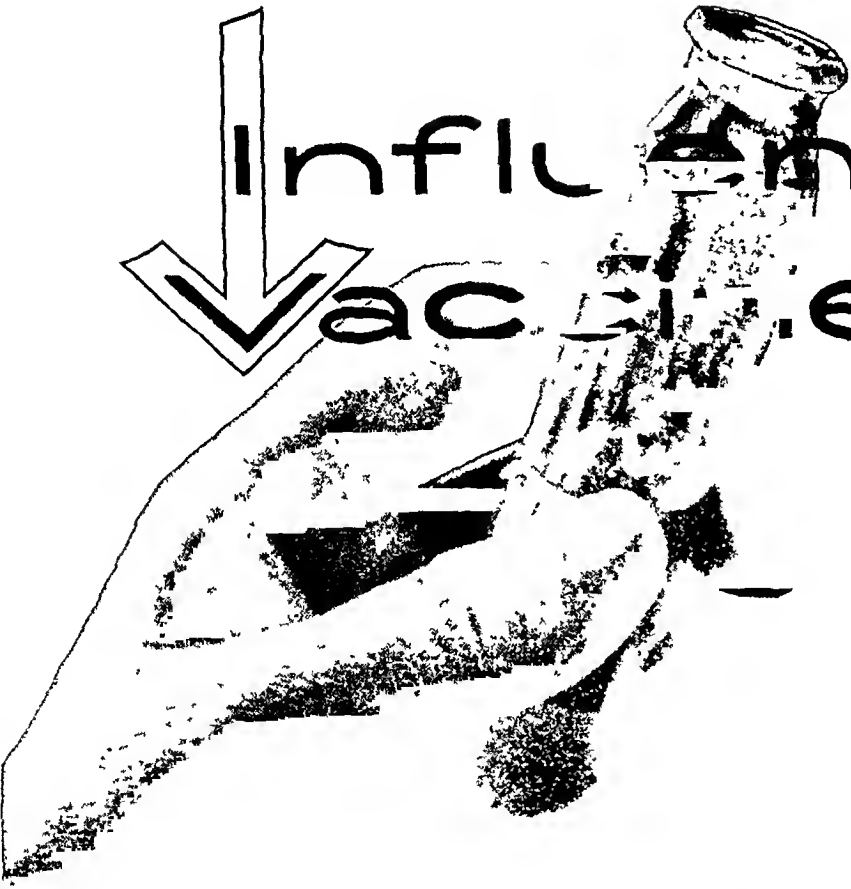
| Age (years) | January | | February | | March | | April | | May | | June | |
|------------------|---------|------|----------|------|-------|------|-------|------|--------|------|------|------|
| | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 |
| All ages----- | 616 | 600 | 544 | 606 | 685 | 636 | 715 | 737 | 1, 850 | 761 | 782 | 808 |
| 0-1----- | 234 | 200 | 201 | 221 | 253 | 241 | 274 | 277 | 519 | 277 | 241 | 301 |
| 1-4----- | 66 | 77 | 92 | 81 | 100 | 82 | 123 | 116 | 144 | 122 | 144 | 153 |
| 5-9----- | 12 | 14 | 11 | 25 | 25 | 23 | 25 | 29 | 151 | 20 | 13 | 23 |
| 10-14----- | 5 | 13 | 6 | 6 | 3 | 7 | 11 | 8 | 30 | 11 | 10 | 5 |
| 15-24----- | 28 | 28 | 34 | 24 | 22 | 20 | 19 | 31 | 68 | 33 | 46 | 32 |
| 25-44----- | 71 | 78 | 50 | 73 | 73 | 68 | 73 | 73 | 184 | 84 | 105 | 78 |
| 45-64----- | 96 | 93 | 63 | 76 | 97 | 107 | 83 | 89 | 193 | 97 | 113 | 102 |
| 65 and over----- | 104 | 97 | 87 | 100 | 112 | 88 | 107 | 114 | 258 | 117 | 110 | 114 |

AI
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Testing



Influenza
Vaccines



SELECTED STEPS
IN THE PROCEDURE
FOR SAFETY, PURITY, AND POTENCY

Table 7. Average weekly number of deaths from influenza and pneumonia, Singapore, 1957

| Period | Influenza and pneumonia | Influenza | Pneumonia |
|----------------------------------|-------------------------|-----------|-----------|
| Dec. 30, 1956-Jan. 26, 1957----- | 14 | ----- | 14 |
| Jan. 27-Feb. 23----- | 12 | ----- | 12 |
| Feb. 24-Mar. 30----- | 14 | 1 | 13 |
| Mar. 31-Apr. 27----- | 16 | ----- | 16 |
| Apr. 28-May 4----- | 17 | 1 | 16 |
| May 5-11----- | 45 | 8 | 37 |
| May 12-18----- | 73 | 12 | 61 |
| May 19-25----- | 98 | 24 | 74 |
| May 26-June 1----- | 39 | 8 | 31 |

the 3-week period April 14-May 4, the weekly totals of deaths from all causes and from tuberculosis were clearly in excess of the trend prior and subsequent to this period. Furthermore, this period exactly coincides with the reported time of the epidemic of influenza in Hong Kong. Similar data on deaths from influenza and bronchopneumonia could not be found.

For Singapore weekly reports of the city health office gave the number of deaths from influenza and pneumonia, but the number of deaths from all causes was not available. It will be seen from table 7 that excess mortality from influenza and pneumonia combined is unquestionable during the period May 5-June 1, which is consistent with the reported outbreak of epidemic influenza in Singapore.

Certainly a more detailed analysis of mortality data from Hong Kong and Singapore would be helpful, but the excess mortality described earlier in connection with the influenza epidemic in Manila cannot be considered an experience peculiar to this city, nor should broad reports of "no fatalities" be accepted without careful attention to total mortality.

Summary

During the week ending May 11, 1957, the reported cases of influenza in Manila, Philippines, gave evidence of the existence of an abnormal incidence of this disease. In the 4 weeks which followed, weekly reported totals were markedly in excess of the endemic levels customarily recorded.

Epidemiological intelligence of the Singapore office of the World Health Organization indicates that several weeks prior to the occurrence of epidemic influenza in Manila, outbreaks of influenza had occurred in China, Hong Kong, and Taiwan. It seems probable that epidemic influenza was introduced into Manila from Hong Kong or Taiwan, or both.

The percentage of the population attacked was determined by means of a household survey of a representative sample of households in Manila. For all ages combined, the attack rate was 70 percent. Maximum attack rates were noted in the age range 1-14 years, with evidence of a decline with increase in age for those 15 years of age and over. However, no age group experienced an attack rate of less than 50 percent. Sex differences were not found, nor was there evidence of variation of attack rates with population density.

Excess mortality was unquestionably attributable to the epidemic. One impression is that as an immediate consequence of the epidemic there was an excess of 84 deaths per 100,000 population, a ratio which varied from maximums of 477 for infants under 1 year of age and 374 for persons 65 years and over to a minimum of 13 for age groups 10-14 and 15-24.

The full impact of an influenza epidemic should be assessed in terms of mortality from all causes rather than in deaths specifically ascribed to influenza.



Mice are immunized with vaccine dilutions. Two weeks later, their blood serum is tested for antibodies.



Mouse receives intranasal drops containing influenza virus and antiserum. A 10-day survival indicates that the antiserum is effective and that the vaccine used in its production meets potency requirements.



Lungs of a mouse infected with influenza virus are dropped into a test tube containing alundum, a sandlike substance, to be ground for preparation of a virus suspension used in tests.

Vaccine Testing Procedures For Asian Strain Influenza

Commercially produced influenza vaccine prepared from the Asian strain virus is tested by the Public Health Service to determine conformance with prescribed standards. Scientists at the Division of Biologics Standards, National Institutes of Health, test samples from each manufacturer to insure safety, purity, and potency of the vaccine. The first lots of the new vaccine were released for use on August 12, 1957, 2½ months after 6 licensed vaccine manufacturers were sent isolations of the Asian strain virus. Some of the procedures used in testing these lots are illustrated here. (*Material presented by the Division of Biologics Standards and the Division of Research Services.*)



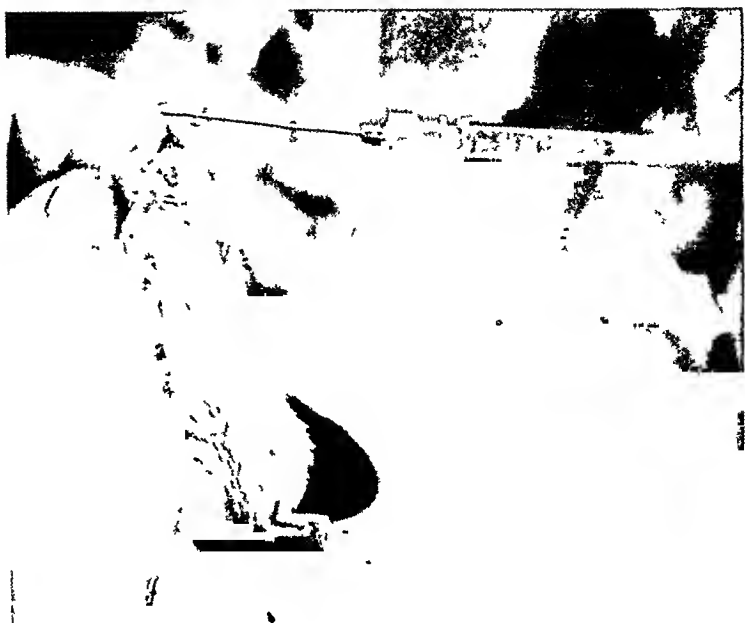
Sample of vaccine is logged in. After it is unpacked, the manufacturer's name, vaccine lot number, and other information are recorded, and testing proceeds.



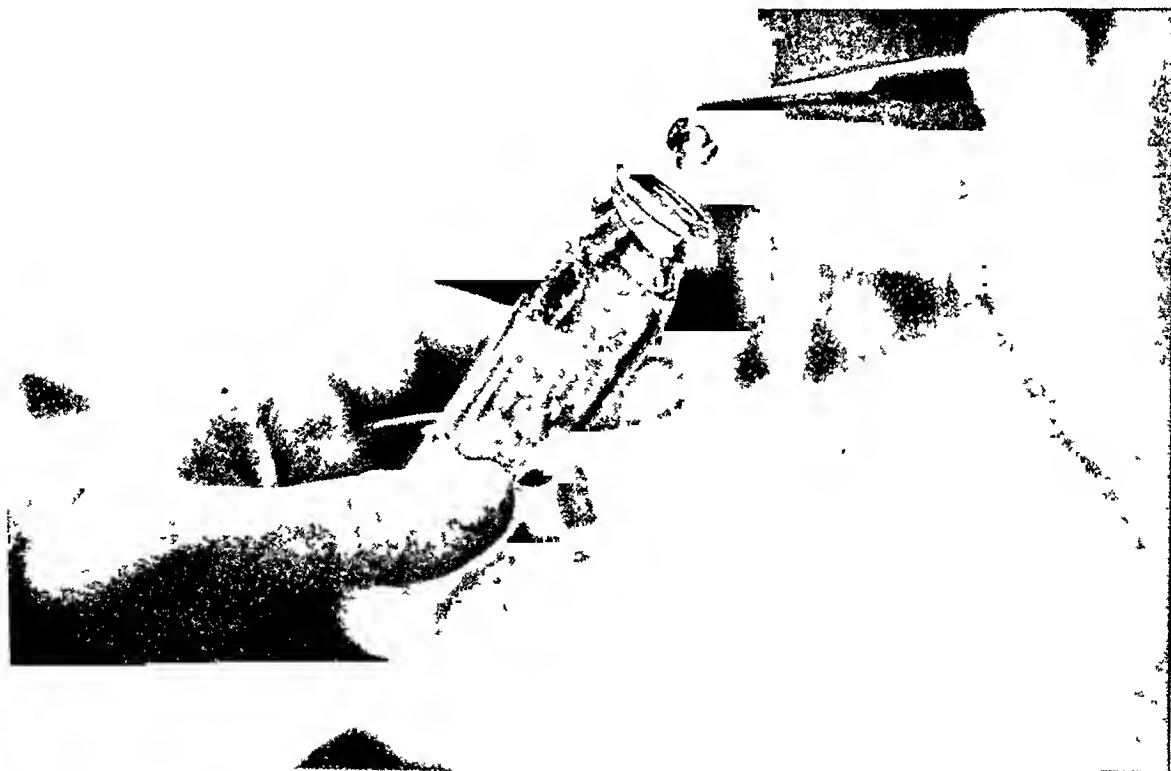
In an early step of potency tests, various dilutions of the vaccine are made. Ratios of vaccine to saline solutions are indicated on the top of each of the containers.



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Biological Warfare and Its Defense

LeROY D. FOTHERGILL, M.D.

SINCE any enemy nation might be expected to use all the weapons in its arsenal, it would follow that it would give serious consideration to biological warfare. Because of this possibility it is incumbent upon each of us to become fully acquainted with the nature of biological warfare.

What BW Is

By way of definition, biological warfare is the intentional use of living micro-organisms or their toxic products for the purpose of destroying or reducing the military effectiveness of man. Man may also be injured secondarily by damage to his food crops or domestic animals. The military objective, of course, is to reduce the will or capability to wage war.

It has sometimes been said that BW is public health practice and procedure in reverse. This is an erroneous conception. BW is the deliberate use of natural disease agents whose inherent potential has been exploited by scientific research and development resulting in the production of BW weapons systems.

Military campaigns and troop concentrations have always provided a fertile field for naturally occurring epidemic disease. Infectious disease has often been the critical factor in the outcome of a military campaign.

Bubonic plague was said to have stopped the Crusaders at the very gates of Jerusalem. Dysentery probably caused more casualties in

Napoleon's Grand Army than enemy firearms. Typhoid fever and dysentery played no favorites among the opposing forces in the Civil War, the Boer War, and the Spanish-American War. The new science of bacteriology was in its infancy around 1900. Even during World War I, infectious disease was a controlling factor in some campaigns. It is quite clear that typhus fever prevented the Germans from carrying through their Balkan campaign.

In spite of all our modern sanitation and preventive medicine, infectious disease contributed a large share to the cost and difficulty in World War II. Malaria ranked high as an enemy, both in the Mediterranean and in the Southwest Pacific, and scrub typhus caused some 7,000 casualties in the latter area. And finally, it seems almost yesterday that enteric infections, Japanese B encephalitis, and hemorrhagic fever were bedeviling us in the Korean conflict.

In the past, a number of crude, unscientific, and purely local efforts were made to utilize infectious disease for military purposes. Alexander attempted such exploitation by catapulting the bodies of dead men and animals over the walls of besieged cities. It is reported that smallpox was started successfully among the American Indians during the French and Indian War by distributing blankets contaminated with purulent smallpox material. In World War I the Germans infected with glanders horses that were consigned from this country to the Roumanian cavalry. During World War II a number of units of the German Occupation Forces, particularly in Eastern Europe, were said to have been the target of local sabotage efforts with bacteriological agents.

Dr. Fothergill, scientific adviser to the Chemical Corps, Fort Detrick, Md., delivered this paper at a joint meeting of the Nevada State Medical Association and the Reno Surgical Society, at Reno, August 1956.



Eggs are injected with influenza virus. This is the first step in preparing larger amounts of virus suspensions to be used in various laboratory tests.



Extra-embryonic fluid containing influenza virus is withdrawn from a hen's egg for study. Ultraviolet light prevents contamination with other viruses or bacteria.



Blood withdrawn from a chicken immunized against influenza is used to prepare serum. The serum serves in a variety of tests concerned with control of the vaccine.



Electron micrograph of a red blood cell (greatly magnified) of a chicken with influenza virus. Small woolly spots around the nontransparent nucleus are the virus.

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All of these efforts were, of course, small, local, makeshift, and unorganized with respect to centralized control and direction. It was not until early in World War II that an officially planned program was devoted to research and development in biological warfare. This has continued to the present time as a recognized activity of the Department of Defense. Responsibility for carrying out a program was delegated to the Department of the Army which, in turn, assigned the operational responsibility to the Army Chemical Corps. The major portion of the research and development is conducted at Fort Detrick in Frederick, Md. Close liaison is maintained with other Federal agencies having defensive responsibilities, including the Federal Civil Defense Administration, the Public Health Service, the Food and Drug Administration, and the Department of Agriculture. That a program of research and development continues in permanent facilities constructed for the purpose can be considered as recognition of the potential of the weapon and thus of the defensive problems which we must be prepared to meet.

Effective Agents

Biological warfare is considered to be primarily a strategic weapon which makes it a particular defensive problem for civilian population centers. The major reason for this is that it has no quick-kill effect. The incubation period of infectious disease plus a variable period of illness even before a lethal effect make this weapon unsuitable for hand-to-hand encounter. A man can be an effective fighting machine throughout the incubation period of most infectious diseases. Hence, an enemy would probably consider this weapon as primarily suited for attack on static population centers such as large cities, and thus our principal concern is with civil defense. There is little point at the moment in considering how it may be used against troops.

An important operational procedure in BW for an enemy would be to create an aerosol or cloud of agent over the target area. This fundamental concept has stimulated much basic research concerning the behavior of biologic particulates, the pathogenesis of respira-

tory infections, the medical management of such diseases, and defense against their occurrence.

The importance of particle size in such aerosols has been recognized. The natural anatomical and physiological defensive features of the upper respiratory tract, such as the turbinates of the nose and the cilia of the trachea and larger bronchi, are capable of impinging out the larger particles to which we are ordinarily exposed in our daily existence. Very small particles, however, in a size range of 1 to 4 microns are capable of passing these impinging barriers and entering the alveolar bed of the lungs. This area is highly susceptible to infection. The entrance and retention of infectious particles in the alveoli amounts almost to an intratissue inoculation.

In considering BW defense, it is well to know that there are a number of critical micro-meteorologic parameters which must be met for an aerosol to exhibit optimum effect. Generally, bright sunlight is rapidly destructive to living micro-organisms suspended in air. There are optimal humidity requirements for various airborne agents. Neutral or inversion meteorologic conditions are necessary in order for a cloud to travel along the surface. It will rise during lapsed conditions. There are, of course, certain times during the 24-hour daily cycle when most of these conditions will be met. This is important in gas warfare also. Moreover, the importance of these meteorologic conditions has long been recognized in connection with certain natural phenomena such as the occurrence and persistence of smog over an area.

Certain other properties of small particles, in addition to those already mentioned in connection with penetration of the respiratory tract, are noteworthy in defense considerations. The smaller the particle, the farther it will travel downwind before settling. An aerosol of such small particles diffuses through structures in much the same manner as a gas, a property of considerable importance in connection with certain defensive considerations.

A number of unique medical problems might be created when man is exposed to an infectious agent through the respiratory route rather than through the natural portal of entry. Some

agents have been shown to be much more toxic or infectious to experimental animals exposed to aerosols of optimum particle size than by the natural portal. Botulinal toxin, for example, is several thousandfold more toxic by the respiratory route than when given by mouth. In some instances, a different clinical disease picture may result from this route of exposure, making diagnosis difficult. In tularemia produced by aerosol exposure, one would not expect to find the classical ulcer of "rabbit fever" on a finger.

There are a number of agents that an enemy might select from the several classes of microorganisms (bacteria, viruses, rickettsiae, fungi, or toxic products of certain organisms). There are, however, certain general characteristics that should be met in making a selection.

An enemy would obviously choose an agent that is believed to be highly infectious. Agents that are known to cause frequent infections among laboratory workers, such as those causing Q fever, tularemia, brucellosis, glanders, coccidioidomycosis, belong in this category.

An agent would likely be selected which would possess sufficient viability and virulence stability to meet realistic minimal logistic requirements. It is, obviously, a proper goal of research to improve on this property. In this connection an agent should be capable of being disseminated without excessive destruction. Moreover, it should not be so fastidious in its growth requirements as to make production on a militarily significant scale improbable.

An aggressor would seek minimal, naturally acquired or artificially induced, immunity in a target population. A solid immunity is the one effective circumstance whereby attack by a specific agent can be neutralized. It must be remembered, however, that there are many agents for which there is no solid immunity and a partial, or low-grade, immunity may be broken by an appropriate dose of agent.

There is a broad spectrum of agents from which selection for a specified military purpose might be made. An enemy might choose an acutely debilitating agent, a chronic disease producer, or one causing a high death rate.

It is possible that certain mutational forms may be produced such as drug-resistant strains. Mutants may be developed with changes in bio-

chemical properties that are of importance in identification. All these considerations are of critical importance in considering defense and medical management.

One point needs serious emphasis. The likelihood of creating an entirely new agent of unique virulence, or new disease-producing capability, is extremely remote. Even the remarkable genetic progress made in producing bacterial transformation in recent years does not warrant deviation from this opinion at the present time.

Certain general considerations in connection with BW agents merit some discussion.

Biological agents are, of course, highly host-specific. They do not destroy physical structures as is true of high explosives. This may be of overriding importance in considering military objectives.

One must be unremitting in emphasizing that there is no secrecy concerning the agents which might be included in an overall BW arsenal. Only certain agents will meet the general and specific BW requirements. Both we and any potential enemy know them. This is not like inventing or rather synthesizing a new chemical poison. One frequently hears it said, "If we only knew what agents our potential enemies were working on, we would know what to defend ourselves against." This platitudinous statement is parroted ad nauseam. This is the kind of statement that is made by an ostrich before burying his head in the sand. A more appropriate conjecture would be to ask ourselves, "What are we doing about it? Are we doing enough?"

The question of epidemic disease also merits some discussion. Actually, only a limited effort has been devoted to this problem in the research and development program. Some of the bitterest critics of BW have assumed that the only potential would be in the establishment of epidemics. They then point out that with mankind's present lack of knowledge of the factors concerned in the rise and fall of epidemics, it is unlikely that a planned episode could be initiated. They argue further, and somewhat contradictorily, that our knowledge and resources in preventive medicine would make it possible to control such an outbreak of disease. We agree with this in general, and this is why this

approach to BW defense has not been given major attention in the program. One can charitably hope that such critics never have to breathe air laden with an infectious agent!

Our main concern is what an enemy may accomplish in the initial attack on a target. This, of course, does not eliminate from consideration for this purpose agents that are associated naturally with epidemic disease. A hypothetical example will illustrate this point. Let us assume that it would be possible for an enemy to create an aerosol of the causative agent of epidemic typhus (*Rickettsia prowazekii*) over City A and that a large number of cases of typhus fever resulted therefrom. No epidemic was initiated nor was one expected because the population in City A was not lousy. Lousiness is a prerequisite for epidemic typhus. In this case, then, the military objective was accomplished with an epidemic agent solely through the results accomplished by the initial attack. This was done with full knowledge that there would be no epidemic. On the other hand, a similar attack might have been made on City B whose population was known to be lousy. One might expect some spread of the disease in this case, resulting in increased effectiveness of the attack.

The great inherent potency of BW agents is due to their capacity to multiply when successfully implanted in a susceptible host.

Biological agents are, of course, suitable for delivery through enemy sabotage, which imposes many problems in defense. One can let one's imagination run wild in this regard. One might mention a few obvious, but nevertheless important, areas. The air-conditioning and ventilating systems of large buildings are obvious targets. America is rapidly becoming a nation that uses processed, precooked, and yes, even predigested foods. This is an enormous industry that is subject to sabotage. One must include the preparation of soft drinks and the processing of milk and milk products. Huge industries are involved also in the production of biologic products, drugs, and cosmetics which are liable to this type of attack. These few major areas have been mentioned since sabotage in them would be far reaching in its consequences. Furthermore, all are subject to prophylactic defensive action.

Our major defensive problems, of course, are concerned with the possibility of overt military delivery of biological agents from appropriate disseminating devices. It should be no more difficult to deliver such devices than other weapons. The same delivery vehicles—whether they be airplanes, submarines, or guided missiles—should be usable. If it is possible for an enemy to put an atomic bomb on a city, it should be equally possible to put a biological agent cloud over that city. This points up an enormously important civil defense problem which will be considered in more detail later.

Antifood BW

Another aspect of biological warfare is the possible use of biological agents for the reduction or destruction of agricultural crops and domestic animals, in other words, antifood biological warfare.

The importance of food, particularly during war, needs no emphasis. Actually food production is of major concern to most countries even during peacetime. We are one of the few countries in the unusual position of finding overproduction a major problem.

In all wars, moreover, military efforts have been devoted to the destruction of the enemy's food supply. The grain-laden freighter was as much a prize for a submarine as a ship loaded with tanks.

Biological warfare may find its greatest effectiveness when used for anticrop and antianimal purposes. Contrary to the case in antipersonnel BW, the epiphytotic and epizootic potential of anticrop or antianimal agents would be exploited by an enemy. Antifood biological warfare could play a decisive role in any war that was not decided with pushbutton speed. This country is in a favorable defensive position in anticrop warfare. Our cropping is very diversified and biological agents are, of course, specific for particular crops. Those countries that are generally dependent, for agronomic, climatic, or traditional reasons, on a single crop are the most vulnerable.

It is hoped that this general consideration of biological warfare will serve as a useful framework around which one can build one's defensive thinking and planning. Let us now con-

sider some of the general features of this problem.

Defensive Bank Account

It may seem trite, but nevertheless it is worth while to emphasize, that there is a vast amount of medical knowledge in existence which can be useful. In this sense BW is not completely new. We have had long medical and epidemiological experience with infectious diseases. We have a vast public health effort in being at the Federal, State, and local levels. Our sanitary engineering practices and methods for disease control are at a high level of efficiency. All of these are positive values in our defensive bank account which can be drawn upon in an emergency and would be of great value.

One must not be complacent, however, and be lulled into thinking that BW would be rendered ineffective by these aids. This is not so. These techniques have been developed over the years for dealing with naturally occurring infectious disease. The military exploitation of massive amounts of highly infectious agents through unusual portals of entry creates new problems for which these procedures were not designed and against which no experience has been developed. One might illustrate this point. Adequate means have been developed, for example, for delivering potable water to all inhabitants in a community. We now take this for granted. On the other hand, there is no known public health procedure that will deliver sterile air to all inhabitants of a city. Defense against a massive biological aerosol is a new and critically serious problem.

It is obvious, of course, that medical defensive planning for a community should not be limited to preparation for BW. BW will not cause extensive burns, broken bones, or radiation sickness. All defensive planning should be thoroughly integrated and should be designed to give the maximum practical relief for whatever disaster might befall. For the moment, however, we will consider BW defense only.

One of the most critical problems is detection or early warning. Biological clouds have no characteristics detectable by the senses. They are invisible, odorless, and tasteless, in contrast

to certain gas clouds. Even if they possessed an odor, the odor-detecting sniff might result in a sufficient dose to produce an infection.

As is always true, an initial surprise attack will, of course, be the most serious. Later attacks may be suspected by their general characteristics such as possible noise of a disseminating device, recognition of a dnd device, and, finally, the realization that something has been delivered that is not a conventional weapon.

The importance of such immediate detection and warning is that it may permit certain defensive actions of a physical nature. The gas mask, for example, affords excellent protection to the respiratory tract if it can be put on in time. Early warning may also permit timely entrance into collective shelters should they exist. It is possible to design quite efficient structures for this purpose.

Some progress is being made in the development of instrumentation for rapidly detecting unusual concentrations of particulate matter in the air.

A closely related problem is rapid specific identification of the particular agent. The ordinary biological methods, employed in the diagnostic laboratory, are far too slow. Identification of viruses is especially tedious. This problem is important in that if the agent can be identified in time, it may permit certain medical prophylactic procedures before the onset of illness. Progress is being made in this field, but much remains to be done. One might suggest at this time that any laboratory conducting research to improve and speed up identification of disease organisms will be making a significant contribution to the defense effort.

Defense Needs

Another defensive activity is decontamination or cleanup after an attack. Much technical knowledge has been developed in this field and is available to defense authorities. One might point out that most of the effort has been devoted to developing procedures for specific and isolated use. One could not hope to decontaminate an entire city. Indeed, this would not be necessary. Sunlight and time are remarkable decontaminants. One may have ur-

approach to BW defense has not been given major attention in the program. One can charitably hope that such critics never have to breathe air laden with an infectious agent!

Our main concern is what an enemy may accomplish in the initial attack on a target. This, of course, does not eliminate from consideration for this purpose agents that are associated naturally with epidemic disease. A hypothetical example will illustrate this point. Let us assume that it would be possible for an enemy to create an aerosol of the causative agent of epidemic typhus (*Rickettsia prowazekii*) over City A and that a large number of cases of typhus fever resulted therefrom. No epidemic was initiated nor was one expected because the population in City A was not lousy. Lousiness is a prerequisite for epidemic typhus. In this case, then, the military objective was accomplished with an epidemic agent solely through the results accomplished by the initial attack. This was done with full knowledge that there would be no epidemic. On the other hand, a similar attack might have been made on City B whose population was known to be lousy. One might expect some spread of the disease in this case, resulting in increased effectiveness of the attack.

The great inherent potency of BW agents is due to their capacity to multiply when successfully implanted in a susceptible host.

Biological agents are, of course, suitable for delivery through enemy sabotage, which imposes many problems in defense. One can let one's imagination run wild in this regard. One might mention a few obvious, but nevertheless important, areas. The air-conditioning and ventilating systems of large buildings are obvious targets. America is rapidly becoming a nation that uses processed, precooked, and yes, even predigested foods. This is an enormous industry that is subject to sabotage. One must include the preparation of soft drinks and the processing of milk and milk products. Huge industries are involved also in the production of biologic products, drugs, and cosmetics which are liable to this type of attack. These few major areas have been mentioned since sabotage in them would be far reaching in its consequences. Furthermore, all are subject to prophylactic defensive action.

Our major defensive problems, of course, are concerned with the possibility of overt military delivery of biological agents from appropriate disseminating devices. It should be no more difficult to deliver such devices than other weapons. The same delivery vehicles—whether they be airplanes, submarines, or guided missiles—should be usable. If it is possible for an enemy to put an atomic bomb on a city, it should be equally possible to put a biological agent cloud over that city. This points up an enormously important civil defense problem which will be considered in more detail later.

Antifood BW

Another aspect of biological warfare is the possible use of biological agents for the reduction or destruction of agricultural crops and domestic animals, in other words, antifood biological warfare.

The importance of food, particularly during war, needs no emphasis. Actually food production is of major concern to most countries even during peacetime. We are one of the few countries in the unusual position of finding overproduction a major problem.

In all wars, moreover, military efforts have been devoted to the destruction of the enemy's food supply. The grain-laden freighter was as much a prize for a submarine as a ship loaded with tanks.

Biological warfare may find its greatest effectiveness when used for anticrop and antianimal purposes. Contrary to the case in antipersonnel BW, the epiphytotic and epizootic potential of anticrop or antianimal agents would be exploited by an enemy. Antifood biological warfare could play a decisive role in any war that was not decided with pushbutton speed. This country is in a favorable defensive position in anticrop warfare. Our cropping is very diversified and biological agents are, of course, specific for particular crops. Those countries that are generally dependent, for agronomic, climatic, or traditional reasons, on a single crop are the most vulnerable.

It is hoped that this general consideration of biological warfare will serve as a useful framework around which one can build one's defensive thinking and planning. Let us now con-

warning of a BW attack. The prompt recognition and reporting of such episodes is essential.

It is important to have available the services of an organized network of laboratories having the qualifications and equipment necessary for the recognition and identification of unusual agents. Such services are needed particularly in the virus field. The personnel in such laboratories should be trained and indoctrinated in those features of BW that may have a special bearing on their responsibilities. This should include training in the use of new detection devices and new procedures for more rapid identification of agents.

There must, of course, be adequate planning for optimum emergency hospital and medical

service. Each community must plan the details in this connection.

Our defensive considerations may be concluded with a few words concerning prevention of sabotage. A careful vulnerability study should be made of all sensitive industries and facilities to determine the most likely spots of attack. There should be proper policing and guarding of such spots. Loyal employees should be indoctrinated to the point of being able to augment such guarding. Adequate chlorination of water supplies should be assured. Air-conditioning and ventilating systems of sensitive buildings should be appropriately protected. And, finally, one must not neglect the simple but very effective techniques of heating or boiling food products.



INTERNATIONAL MAIL POUCH

Surinam Sojourn

As a guest of a medical service expedition in Surinam, I was able to study some of the pathologies of Bush Negroes and Amerindians. Four doctors are assigned to serve villages scattered through 43,000 square miles of jungle. At present, only two are well and working. They travel primarily by canoe or small motor craft along rivers and creeks, notwithstanding falls, rapids, logs, alligators, and pythons. There are no roads through the jungles. To follow footpaths and camp overnight is not advisable. The waterways are less strenuous and safer.

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Pass the Water

I think we watered an acorn this month. After a year of preliminaries, the provincial government authorized the city of Taipei to hire engineers for the establishment of a sewerage unit. Two weeks ago the mayor decided to activate the unit to design a waterborne sewerage system, initially for the

residential half of the city, and to make an official request for the assistance of a WHO design engineer. The start of work was set for the first of the month. Rule-of-thumb cost estimates indicate the project will approximate NT\$500,000,000—sufficient to dwarf any other sanitation project now contemplated.

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Tribal Vaccination

"May Allah bless you! You young men have risked your lives by crossing these mountain passes to save our lives." A Bakhtiari tribal chief spoke thus to the physician in charge of the Isfahan tribal vaccination program.

The vaccination team first found out what routes the tribesmen in Iran would use on their way to summer pastures and the time they would begin to move. A six-man unit then waited at the mountain pass most of the vast Bakhtiari tribe were to cross. Another unit set up a field clinic at a bridge along the route used by others.

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gent need, however, for decontaminating specific equipment, structures, or isolated areas.

The most important of all defensive procedures is prophylaxis by active biological immunization. A number of effective immunizing materials are already available for some infectious diseases. On the other hand, there are a number of potential BW agents against which there is no method of immunization. There are several cases where the value of the immunizing material continues to be questionable, at least or where improvement must be sought through research.

One must encourage all research possible that is devoted to the development of new or improvement of old methods of active immunization. All ancillary research dealing with host-parasite relationships will have positive defense value. Moreover, all such research has great peacetime value. It will not be totally consumed in an engine of war.

The administrative problems in connection with the immunization of large populations against a number of agents are enormous. This, too, is an area where research should be fruitful because simplified techniques for rapid, mass immunization are essential. Considerable effort is being devoted to the development of combined or multiple vaccines, an effort that is being rewarded with some success.

There is also the very large field of passive biologic and antibiotic prophylaxis, that is, the use of antimicrobial agents after exposure to the agent but before the onset of illness. This problem merits some detailed discussion.

The use of immune serums, even if effective, would be extremely limited in BW. The production and distribution of the enormous quantities required would be very difficult if not totally unrealistic. On the other hand, the desirability of having some stocks in hand for limited and specialized use should be kept in mind.

More detailed discussion is warranted in connection with the possible prophylactic use of antibiotics and chemotherapeutic drugs. The importance of this has been overplayed in the past. It is essential, therefore, to point out many of the shortcomings of this form of prophylaxis as a guide to future effort.

On several occasions, articles have appeared

expounding the thesis that our enormous antibiotic industry has made biological war obsolete. This is, of course, ridiculous for a variety of reasons. To permit such reason to guide our preparation for defense would be suicidal.

There are many potential BW agents which there is no known effective antibiotic drug. Among these may be mentioned *Coccidioides immitis*, *Histoplasma capsulatum* and, more importantly from a BW standpoint, most of the filtrable viruses.

While we have some antibiotics that exhibit a considerable spectrum of activity, there are others whose greatest value is in use against a specific agent. For prophylactic BW defense after an attack, it would mean, therefore, finding the right antibiotic in the right amount at the right place at the right time—a logical requirement that is almost impossible to meet. Even these considerations may be academic; moreover, when it is realized that the use of drug-resistant strains of agents is not an unlikely possibility.

In some cases it has been shown that giving an antibiotic immediately after exposure merely prolongs the incubation period without preventing infection. Our British colleagues have recently reported that monkeys exposed to lethal respiratory doses of anthrax spores could be treated for several weeks with an antibiotic and would show no signs of infection during that time. When the drug was withdrawn the animals promptly developed fatal anthrax.

One might conclude this discussion of strict medical prophylaxis by emphasizing that the greatest hope for defense against BW would be the development of effective methods for producing active immunity. Passive prophylaxis with antibiotics and drugs may have limited value. This procedure must not, however, be regarded as a panacea that will render BW obsolete.

There are some additional activities that should be mentioned in connection with BW defense.

Maintaining an adequate epidemiological intelligence service and warning network is of great importance. An unusual occurrence of disease in a particular location may be the first

warning of a BW attack. The prompt recognition and reporting of such episodes is essential.

It is important to have available the services of an organized network of laboratories having the qualifications and equipment necessary for the recognition and identification of unusual agents. Such services are needed particularly in the virus field. The personnel in such laboratories should be trained and indoctrinated in those features of BW that may have a special bearing on their responsibilities. This should include training in the use of new detection devices and new procedures for more rapid identification of agents.

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| A broad survey of information on the epidemiology of toxoplasmosis
| with an evaluation of data on the transmission of this infection.

The Interrelation of Toxoplasmosis in Swine, Cattle, Dogs, and Man

LEON JACOBS, Ph.D.

THE ORGANISM *Toxoplasma gondii* is an obligate intracellular parasite. Until now, no form has been found which is capable of living for extended periods outside the cells of its numerous hosts. It is capable of invading and multiplying in a wide variety of cell types, such as neurons, microglia, endothelium, reticulum, parenchyma cells of the liver, epithelial cells of the lung and glands, and cardiac and skeletal muscle.

The parasite exists in two forms. The proliferative form, seen during the acute stage of the infection, undergoes rapid intracellular multiplication, and the numerous loosely grouped toxoplasmas thus produced are liberated by rupture and invade new cells. This form of the parasite is motile, showing twisting movements of its attenuated end and gliding movements unaccompanied by any changes in shape or surface visible by ordinary light microscopy. It measures about 3 by 6 microns, has a centrally located nucleus, and glycogen granules of small size. The pseudocyst form probably appears late in the subacute stage of the infection and is the only form which persists in chronic in-

fections. Pseudocysts are generally larger in size than the cells parasitized by proliferating forms. The parasites within them, which are closely packed and more lanceolate, have a subterminal nucleus and larger glycogen granules (1). The latter can be considered characteristic of a resting organism.

The wall of the pseudocyst is considered by some workers as the remains of the host cell wall to which are added some products of the parasite. Others regard it as primarily of parasitic origin. Whatever its origin, the wall of the pseudocyst is argyrophilic and elastic, and at least somewhat resistant to mechanical damage. Also, the pseudocyst appears to be more resistant to environmental changes than are proliferative forms (2).

According to a number of workers, proliferative forms of *Toxoplasma* die rapidly outside the host and in the carcass of dead animals. These forms are destroyed on drying, on changes in osmotic pressure, and on exposure to low heat. Pseudocysts are also unable to withstand drying and are killed by low heat. However, they may survive in dead tissues for up to 2 weeks or longer at refrigerator temperatures, possibly with less attrition than proliferative forms (3). The point of greatest difference is in survival during digestion. It is revealed indirectly by feeding experiments.

Tissues of mice dying of acute toxoplasmosis fed to other mice produce relatively few infections (4). However, when tissues from chroni-

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cally infected mice (5) or rats (2) are fed to mice, more infections result. Acutely infected animals have mainly or only proliferative forms of the parasite, while in chronic infections only pseudocysts are found. It thus appears that pseudocysts are more resistant to digestion.

Epidemiological Data

Toxoplasma gondii is not only indiscriminate as to the cells it parasitizes, but also as to the hosts it infects. It has been isolated in a wide variety of mammals, including primates, artiodactyla, carnivores, rodents, marsupials; in domestic birds such as chickens, pigeons, and ducks; and in wild pigeons and crows. Additional morphological reports, especially on birds, cover some 45 species, but these have not been confirmed. There are also morphological reports of the parasite in reptiles, which have not been confirmed by isolation. In present-day work, it is expected that, in addition to finding the organism, identification will be established by serologic and immunological methods. Other birds such as the canary and grackles, however, and turtles, terrapins, and chameleons have also been given infections in the laboratory.

Toxoplasmosis occurs among animals in both endemic and epidemic form. Surveys in various localities have yielded a number of isolations of the parasite from pigeons, rabbits, rats, dogs, cats, mice, ducks, and chickens. These isolations have been made from healthy animals apparently carrying latent infections. In addition, epidemics of acute toxoplasmosis have occurred on pigeon, chicken, rabbit, and chinchilla farms. Toxoplasmosis has also occurred among wild hares in Denmark, in herds of cattle in Ohio, and in swine in Ohio and Norway (2).

Human infections, as far as we know, occur sporadically. Fortunately, we have not seen epidemics of the disease due to this parasite, and even in individual family groups serologic tests reveal that some members have experienced infections while others have not. Human infection has been found all over the world. Apparently there is continued exposure to the parasite throughout life, because

there is an increasing proportion of positive serologic reactions with increasing age. Serologic surveys have revealed no differences in prevalence between the sexes, except for one report regarding a Swedish island in the Baltic Sea (personal communication from Dr. Sven Gard of the Sachs' Hospital for Children and the Institute for Virus Research, Stockholm). The sex difference was not found on the mainland of Sweden.

There are differences in geographic prevalence of toxoplasmosis. There is relatively less infection in California than in the east. Comparisons of various cities of the United States and of such widely separated populations as those in Tahiti, Alaska, Iceland, and Haiti show considerable differences (6). For instance, Portland, Oreg., has an overall prevalence of about 18 percent, St. Louis 25 percent, New Orleans 31 percent, and Pittsburgh 36 percent. The island of Haiti has a prevalence figure resembling that of Pittsburgh, while Tahiti shows almost 70 percent infected. Icelanders have a low prevalence, and Alaskans are almost entirely free of antibodies. The prevalence is higher in southern than in northern Sweden.

Whether these differences are related to climate is difficult to determine. Accumulated data suggest that toxoplasmosis is more prevalent in warm, moist areas than in cold or hot, dry areas. The coastal areas of Mexico show higher prevalence rates than the region around Mexico City; and the rate among Navajo Indians in Arizona is surprisingly low. There are clues difficult to decipher at present (2).

Because toxoplasmosis has been found in practically all domestic animals, a number of postulates have naturally been advanced on the importance of these animals as reservoirs of the infection for man. To cite only a few, Otten, Westphal, and Kajahn reported finding correlations between canine and human toxoplasmosis (7). Cole and associates stated that toxoplasmas were found in the blood of an asymptomatic woman whose dog had earlier suffered an undiagnosed disease and at the time of the study showed *Toxoplasma* antibodies (8). In a personal communication, Sabin stated that R. H., the unfortunate boy from whose brain was isolated the widely used strain of *Toxo-*

plasma designated by his initials, had had a cat in his household that died of an undiagnosed infection some time before the boy became ill. After the finding of *Toxoplasma* in swine (9) and in cattle (10), the postulate was advanced that humans acquire the infection from pork and beef.

An outstanding example of infection among humans and animals in relatively close contact was reported by Gibson and Eyles at the meetings of the American Society of Tropical Medicine and Hygiene in November 1956. The investigation started with a fatal case of congenital toxoplasmosis in a woman in Memphis. Tests on her two older children showed high levels of antibodies, but those on her husband proved negative. The family house was close to a garbage dump frequented by numerous stray animals. Examinations of animals caught in the area resulted in isolation of *Toxoplasma* from cats, dogs, mice, pigeons, ducks, and chickens. Thus the infection appears widespread; it seems that there is a sea of *Toxoplasma* infection around us. In order to evaluate the importance of various animals in the spread of the infection to man, it is necessary to relate the characteristics of the infection in many hosts and also to observe the strain differences in the parasite.

Characteristics of the Infection

The acute stage of the infection is initiated after an incubation period which varies in length depending on the size of the inoculum. During the incubation period, there is local proliferation of the parasite at the site of inoculation. This is followed by the generalized spread of the organism through the blood stream and the invasion of susceptible tissue cells all over the body. In these tissues, parasites multiply, with the production of focal areas of necrosis. In animals succumbing to the infection, parasitemia mounts to high levels. Also, in animals with acute toxoplasmosis, parasites are found in the urine and feces of mice and dogs; in the milk of mice, sows, cows, and bitches; in a serous exudate from the conjunctiva of a pigeon; in saliva of mice and rabbits. They have also been demonstrated in one instance in saliva of man (2).

The parasites which are released to the outside from such acutely ill animals are proliferative forms. This form of the parasite is very delicate; it does not survive long outside its hosts. This is attested to by the fact that there is little spread of toxoplasmosis among animals even closely confined in the laboratory. Clean mice in the same jar with infected mice do not become infected. There is only one report of such transmission, in which uninfected puppies caged with a littermate dying of toxoplasmosis eventually became infected (11). We have been unable to repeat this observation under similar circumstances. Despite the finding of parasites in the lungs and in saliva of rabbits, an attempt in our laboratory to produce infections in these animals by spraying large numbers of proliferative parasites into a confined space holding clean rabbits did not result in transmission. It appears that only under exceptional circumstances of very intimate contact can transmission be effected from sick animals.

The subacute stage of the infection is characterized by the appearance of serum antibodies and by a clearing of the parasitemia. Following this, there is a gradual clearing of the tissues. This has been measured in rats (12), in dogs (13), in chickens (2), and in pigeons (14). We also have unpublished data on guinea pigs and cats, and Eyles and his co-workers have additional information on chickens. In general, the liver, spleen, and lung clear of parasites relatively rapidly, the heart somewhat later, and the brain last of all.

The persistence of parasites in pseudocysts is characteristic of the chronic form of the infection. In the brain of mice, rats, and pigeons, parasites have been found for as long as 3 years after infection, and in the brain of dogs, 9 and 10 months after infection. Occasionally other organs are also found positive. In the liver of a dog, for example, we demonstrated parasites 2 years after inoculation. Unfortunately, not enough studies have been made of skeletal muscle to say how long this tissue usually harbors pseudocysts. There is probably considerable variation from host to host in this respect. For example, we found that the skeletal muscle of chickens clears very rapidly following experimental infection. On the other hand, in tests of chronically infected rats currently underway

in our laboratory, some have shown muscle still infective 6 months after inoculation. We have also found muscle positive in a case of human lymphadenopathic toxoplasmosis at least 3 months after onset of the infection, and Kass and associates found the parasites in the muscle of a fatal human case (15). Occasional histopathological findings of parasites in human and animal muscle without any inflammatory reaction in surrounding tissues indicate that pseudocysts may persist in the flesh of apparently cured cases. Because of the variation from host to host, each species of host must be studied individually, and some quantitative data must be gathered as to the relative frequency of this occurrence. It is also necessary to study a wide variety of strains of the parasite in these hosts.

Variations in Parasite Strains

Strains of *Toxoplasma* isolated from various species of animals and birds are biologically and immunologically similar, and on this basis only one species of parasite, *T. gondii*, is recognized. However, some variation in strains has been noted. The main criteria for describing strain differences are the virulence of the parasites for laboratory hosts and the characteristics of the disease produced in them.

A comparison of infections produced by a number of virulent strains and by one of relatively low virulence shows that strains highly virulent for mice usually produce the most severe disease in the other laboratory hosts. There is, in general, a lower parasitemia, less tissue invasion, and shorter persistence of parasites in infections with a strain of low virulence. A sudden change in virulence has been reported by Lainson who found that avirulent strains isolated from rabbits were greatly enhanced in virulence by passage through multimammate rats (16). Strains isolated from sick animals in nature are frequently highly virulent for experimental hosts. Strains isolated from animals without disease are more likely to produce latent infections in the laboratory. This has been our experience with strains isolated from a dog and from pigeons. Similar reports have been made concerning strains from rabbits, guinea pigs, dogs, cats, and other natural hosts. Since surveys have revealed considerable natu-

ral infection in man and animals, and relatively little disease, it seems reasonable to conclude that the parasite as it exists in nature is well adapted to its hosts and that it produces little disease unless it undergoes some spontaneous change or encounters a host which is peculiarly susceptible.

The susceptibility of the host is important. Erichsen and Harboe described an epidemic of toxoplasmosis in a flock of chickens in Norway (17). The parasite was isolated and maintained in the laboratory in mice but failed to produce fatal experimental infections in chickens, even when birds were used of the same breed as those on the affected farm. In our laboratory, we have been unable to produce disease in chickens even with large inoculums.

Toxoplasmosis in Dogs

Mello first described spontaneous toxoplasmosis in a dog, with diarrhea, emaciation, anemia, dyspnea, and abdominal tenderness (18). Since this report, over 50 cases of the infection in dogs have been reported from all parts of the world (16, 19). Some of these cases were fatal, and others merely were coincidental findings of parasites in histological sections of tissues of dogs dead of other diseases.

There is also serologic evidence that dogs are frequently found infected in nature. Miller and Feldman found dye test antibodies (titers of 1:16 or more) for *Toxoplasma* in 59 percent of 51 dogs at Syracuse, N. Y. (20). Siim found 18.5 percent of 54 dogs in Copenhagen had relatively high dye test titers, 1:250 or more (21). Otten and associates in Hamburg, Germany, found 35.7 percent of 84 dogs positive by the same test (7). Morris and associates examined, by the complement fixation test, 180 dogs from the Middle Atlantic States, and found 25 percent infected (22). Lainson, in England, found 42.5 percent of 113 serums from London dogs positive by the complement fixation test (23).

Thus, the dog merits attention as a possible reservoir of the infection for man. Miller and Feldman (20) and Jacobs and associates (13) have pointed out that the widespread occurrence of *Toxoplasma* antibodies among humans and dogs makes it difficult to decide in any particu-

lar case that an infection in a canine pet is related directly to human infection. Nevertheless, a number of instances can be cited from the literature in which "sickness" in a dog occurred in a household where there was a human case of toxoplasmosis. Westphal and Finke report that a woman with a dye test titer of 1:100 had an abortion of an infant with hydrocephalus; the woman's husband and pet dog also had positive tests (24). In another case of congenital toxoplasmosis proved by isolation of the parasite, three dogs in the household of the mother had suffered a disease considered clinically, by hindsight, suggestive of toxoplasmosis; the dogs were not tested for antibodies.

In still another case, a sick dog was found in the home of a woman who had borne a hydrocephalic infant. They also reported that a woman with nervous symptoms and a dye test titer of 1:200 had 6 months previously lost a dog which was diagnosed as having distemper. Prior and associates reported 3 cases diagnosed as toxoplasmosis, 2 in women and 1 in a child (25). The women both had dogs which were found to have toxoplasmosis. A human case of myocardial toxoplasmosis in England (26) proved by isolation of the parasite from the heart (27) had been associated with a dog sick with vomiting and diarrhea. Miller and Feldman also cited a sick dog in a household where a case of congenital toxoplasmosis occurred (20).

In all of these cases, no evidence was presented that the disease in the animals was definitely toxoplasmosis, except for the report of Prior and associates. Their study presents its own problems in that the dye test titers found in their two adult cases were much lower than those reported by others in proved cases of systemic toxoplasmosis in adults, either mild or acute. Also, the dye test titer in the dog of one of these cases was again surprisingly low relative to the duration of the illness. These reports stimulate further investigation.

Because of the widespread and frequent occurrence of *Toxoplasma* antibodies in both humans and dogs, any correlation between the infection in these two hosts depends on extensive survey techniques. Otten and associates tested 38 people whose dogs had *Toxoplasma* antibodies; they found 23 had dye test titers of

1:25 or higher (28). Unfortunately, they had no control group of people in the same age groups and circumstances, and the survey is small. Otten and associates also reported that 5 of 6 veterinarians, 3 of 5 veterinary assistants, and 3 of 3 kennel keepers all had *Toxoplasma* antibodies demonstrable by the dye test. Cole and associates in this country also reported a correlation between *Toxoplasma* antibodies in pets and their masters (8). It appears from these studies that there may be a relation between human and canine infections. However, there have been cases of human toxoplasmosis which have not had even remote contact with dogs. This suggests that if the dog is a reservoir of infection for humans, it is not the only such reservoir. Because of their association, dogs and man may acquire toxoplasmosis from the same source or sources.

Experimental canine toxoplasmosis has been studied by a number of investigators with similar results. Nicolle and Conor (29), Boez (30), and Westphal and Finke (24) could not produce disease in mature dogs by the inoculation of virulent parasites by various routes. Laveran and Marullaz produced disease by the intravenous inoculation of parasites (31). Chamberlain and associates were able to produce acute toxoplasmosis in 5 bitches 1½ to 2 years of age, by the intravenous inoculation of large numbers of parasites supplemented by additional injections subcutaneously or intraperitoneally, or by oral administration of as many or even larger numbers of organisms (32).

Even with these efforts, only two deaths occurred among these animals and one of them remained entirely asymptomatic. In 4 of 8 puppies 45 days of age or less, Jacobs and associates produced acute toxoplasmosis by intravenous inoculation, in 3 instances, of 100,000 parasites of the RH strain, and the fourth puppy succumbed to an intravenous inoculation of 10,000 parasites plus a concomitant infection with 200 hookworm larvae (13). Other puppies, including a littermate of the fourth puppy, 5 weeks to 3½ months old, survived intravenous inoculation with 10,000 parasites, or in the case of one 65-day-old dog, 2 million parasites.

Thus, it appears that canine toxoplasmosis is difficult to reproduce in the laboratory, similar

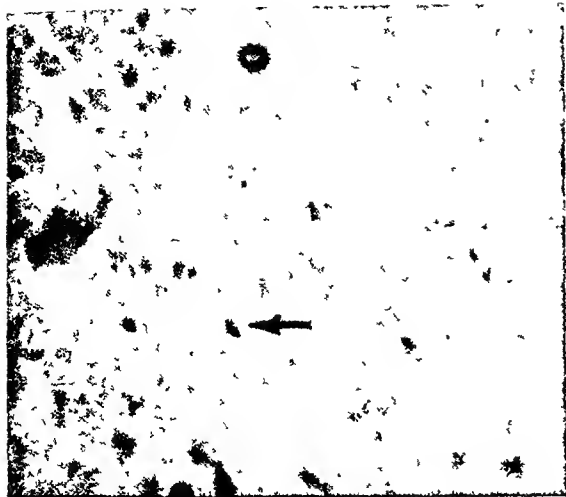


Figure 1. Proliferative forms of *Toxoplasma gondii* in necrotic liver tissue from a mouse. Arrow indicates one of the organisms.

to the phenomenon mentioned above in regard to chickens. Possibly it is explainable on the basis of sudden changes in virulence described by Lainson (16) or by the existence of concomitant viral infections, as noted by Seibold (33) and others.

Although puppies with acute toxoplasmosis had parasites in their urine and feces, Chamberlain's bitches had infective milk, and possibly the saliva of dogs can contain toxoplasmas when the lungs are heavily parasitized, these findings are generally limited to animals in the acute stage of the infection, and to those with severe disease symptoms. In our experimental studies on dogs surviving the infection, we could not demonstrate parasites in the feces or urine, even though isolations could be made for at least 2 weeks from the lung, liver, and spleen.

The course of the infection in dogs begins with a period of parasitemia lasting up to 2 weeks, characterized by a generalized spread of the parasite. At about 2 weeks, antibodies appear, the parasitemia ceases, and there appears to be a diminution of parasites in the tissues, as revealed by longer survival time of mice inoculated with them. However, some parasites remain in pseudocysts and can be occasionally isolated from the brain or other organs long after infection. Older dogs were not found to have a parasitemia.

These results are consistent with the usually asymptomatic toxoplasmosis found in dogs in

nature. It is hardly likely that natural infections are initiated with tremendous numbers of parasites. Hence, when evidence of past exposure to *Toxoplasma* is found in an apparently healthy animal, there is little reason to suspect that the dog experienced an acute symptomatic infection. Since only acutely ill dogs excrete toxoplasmas in their excretions and secretions, and since the proliferative toxoplasmas survive only briefly in the external environment, it seems unlikely that acute disease in dogs is a usual source of human toxoplasmosis. Furthermore, our attempts at producing infections by feeding mice urine and feces of dogs with asymptomatic infections resulted in failure. We therefore lack good evidence of any mechanism by which canine toxoplasmosis can be transmitted to man. Indeed, Feldman and Miller have found that Navajo Indians in Arizona have a very low prevalence of *Toxoplasma* antibodies, while their dogs show a relatively high prevalence (34).

One feature of canine toxoplasmosis deserving special mention is the intestinal ulceration frequently reported in spontaneous cases of the infection. This has also been reported in other carnivores, such as cats, foxes, and ferrets. This suggests, first, the need for more studies to determine whether a resistant form of *Toxoplasma* can be shed in the feces from such intestinal lesions, and secondly, whether these animals acquire toxoplasmosis by the ingestion

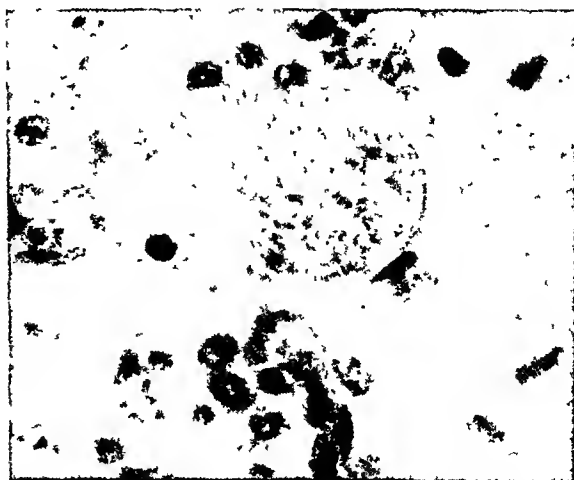


Figure 2. Pseudocyst of *Toxoplasma gondii* in the brain of a mouse.

lar case that an infection in a canine pet is related directly to human infection. Nevertheless, a number of instances can be cited from the literature in which "sickness" in a dog occurred in a household where there was a human case of toxoplasmosis. Westphal and Finke report that a woman with a dye test titer of 1:100 had an abortion of an infant with hydrocephalus; the woman's husband and pet dog also had positive tests (24). In another case of congenital toxoplasmosis proved by isolation of the parasite, three dogs in the household of the mother had suffered a disease considered clinically, by hindsight, suggestive of toxoplasmosis; the dogs were not tested for antibodies.

In still another case, a sick dog was found in the home of a woman who had borne a hydrocephalic infant. They also reported that a woman with nervous symptoms and a dye test titer of 1:200 had 6 months previously lost a dog which was diagnosed as having distemper. Prior and associates reported 3 cases diagnosed as toxoplasmosis, 2 in women and 1 in a child (25). The women both had dogs which were found to have toxoplasmosis. A human case of myocardial toxoplasmosis in England (26) proved by isolation of the parasite from the heart (27) had been associated with a dog sick with vomiting and diarrhea. Miller and Feldman also cited a sick dog in a household where a case of congenital toxoplasmosis occurred (20).

In all of these cases, no evidence was presented that the disease in the animals was definitely toxoplasmosis, except for the report of Prior and associates. Their study presents its own problems in that the dye test titers found in their two adult cases were much lower than those reported by others in proved cases of systemic toxoplasmosis in adults, either mild or acute. Also, the dye test titer in the dog of one of these cases was again surprisingly low relative to the duration of the illness. These reports stimulate further investigation.

Because of the widespread and frequent occurrence of *Toxoplasma* antibodies in both humans and dogs, any correlation between the infection in these two hosts depends on extensive survey techniques. Otten and associates tested 38 people whose dogs had *Toxoplasma* antibodies; they found 23 had dye test titers of

1:25 or higher (28). Unfortunately, they had no control group of people in the same age groups and circumstances, and the survey is small. Otten and associates also reported that 5 of 6 veterinarians, 3 of 5 veterinary assistants, and 3 of 3 kennel keepers all had *Toxoplasma* antibodies demonstrable by the dye test. Cole and associates in this country also reported a correlation between *Toxoplasma* antibodies in pets and their masters (8). It appears from these studies that there may be a relation between human and canine infections. However, there have been cases of human toxoplasmosis which have not had even remote contact with dogs. This suggests that if the dog is a reservoir of infection for humans, it is not the only such reservoir. Because of their association, dogs and man may acquire toxoplasmosis from the same source or sources.

Experimental canine toxoplasmosis has been studied by a number of investigators with similar results. Nicolle and Conor (29), Boez (30), and Westphal and Finke (24) could not produce disease in mature dogs by the inoculation of virulent parasites by various routes. Laveran and Marullaz produced disease by the intravenous inoculation of parasites (31). Chamberlain and associates were able to produce acute toxoplasmosis in 5 bitches 1½ to 2 years of age, by the intravenous inoculation of large numbers of parasites supplemented by additional injections subcutaneously or intraperitoneally, or by oral administration of as many or even larger numbers of organisms (32).

Even with these efforts, only two deaths occurred among these animals and one of them remained entirely asymptomatic. In 4 of 8 puppies 45 days of age or less, Jacobs and associates produced acute toxoplasmosis by intravenous inoculation, in 3 instances, of 100,000 parasites of the RH strain, and the fourth puppy succumbed to an intravenous inoculation of 10,000 parasites plus a concomitant infection with 200 hookworm larvae (13). Other puppies, including a littermate of the fourth puppy, 5 weeks to 3½ months old, survived intravenous inoculation with 10,000 parasites, or in the case of one 65-day-old dog, 2 million parasites.

Thus, it appears that canine toxoplasmosis is difficult to reproduce in the laboratory, similar

Toxoplasma antibodies among 88 hog serums obtained at a slaughterhouse in New Haven, Conn. (39). Furthermore, most of the hogs with antibodies were from one farm, where 16 of 21 pigs examined (over 76 percent) had dye test antibody titers of 1:64 or higher. This farm did not cook the garbage it used as feed, and in addition the premises were overrun by rats.

Weinman and Chandler liken toxoplasmosis to trichinosis and consider it probable that there is transmission from swine to swine, rat to swine, and swine to man. They adduce as additional supportive evidence for this hypothesis certain serologic data on humans. Forty specimens of human trichinosis serums were tested for dye test antibodies; of these, 23 percent were positive at titers of 1:64 or higher, and 18 percent were positive at 1:256 or higher. Because these serums came from all over the United States, they could not assemble an adequate control group of nontrichinosis serums. However, they compare their data with those of Feldman (6) for Portland, Oreg., and New Orleans, and with those of Jacobs and associates (40) for non-pork-eating orthodox Jews. They conclude that their sample has a higher incidence of high dye test titers than these groups, and presume their sample was of older age and therefore should have had lower titers. There is no justification for such a presumption in regard to the Jewish serums, which were practically all from people in age groups from 45 to over 70 years.

Although this thesis is based on circumstantial evidence, some of which is subject to criticism, this evidence represents more positive information than has been obtained in tests of other postulated mechanisms of transmission, such as by arthropods, contaminative means, or droplet infection. There are, however, certain contrary data which require reconciliation with this hypothesis.

First, the prevalence of *Toxoplasma* antibodies, as already mentioned, varies from city to city within the United States. It is higher in the east than it is on the west coast, and higher in the south than the north. On the other hand, the prevalence of trichinosis in the northeastern States and in California is about the same (41), while it is lower in the southern

than the northeastern regions. Secondly, the highest prevalences of *Toxoplasma* antibodies have been found in areas such as Tahiti or Guatemala, among populations that only rarely consume meat or do so only when it is well cooked. Third, in a survey of orthodox Jews in the older age groups in New York, 48 percent were positive for *Toxoplasma* antibodies (40).

The explanation offered by Weinman and Chandler for such discrepancies is that while pork may be one of the more important modes of transmission of human toxoplasmosis, several other sources may exist. Therefore, the failure to find correlations with pork is not definitive. There is merit in their argument. The high prevalence in Tahiti and Guatemala and in persons who do not eat pork can mean that another method of transmission is involved.

We have, therefore, attempted to determine whether meat other than pork accounts for the high prevalence in persons who do not eat pork. We tested the serums of a group of vegetarians belonging to the Seventh Day Adventist sect, and our findings are reported here for the first time.

Forty-six specimens were obtained, mostly from people over 40 years of age who had not eaten flesh for at least 20 years. The percentage of positive dye tests in this group was 21.6, somewhat lower than might be expected in the general population. However, we do not have a good control series for comparison because of the widely different geographic origins of the individuals involved.

Among the positives, high dye test titers were found. The titer distribution is as follows: 1:16, 1 serum; 1:32, 1 serum; 1:64, 3 serums; 1:256, 4 serums; 1:1,024, 1 serum. The highest titer was obtained in a woman 31 years of age who had never eaten meat in her life. The titers of 1:256 were obtained in people who had not eaten meat for 30 or more years. Thus, even though the percentage of positives in this vegetarian population is small, these high titers point to another means of acquiring *Toxoplasma* infection than by ingesting meat.

The gap in the experimental evidence presented by Weinman and Chandler is their failure to report or find parasitized muscle in their infected pigs. Since the distribution of parasites in tissues varies according to type of host,

of infected flesh. The latter hypothesis has support in the observation of Lainson that 2 of 4 dogs with *Taenia* infections had *Toxoplasma* antibodies, while only 1 of 10 dogs without *Taenia* was serologically positive (23). It also has support from already mentioned data on the successful infection of mice by feeding them brains of chronically infected mice and rats, and from some recent studies of the same type using various muscles of rats with latent infections (35). Furthermore, we have seen, in at least one dog, a rise in dye test antibodies following the feeding of infected tissue. Therefore, the source of toxoplasmosis in carnivores could conceivably be small animals serving as their prey, or infected meat from larger animals. And, if carnivores can be so infected, what is the situation in regard to omnivores such as man? This brings us to an evaluation of present data on swine and cattle toxoplasmosis.

Toxoplasmosis in Swine and Cattle

Toxoplasmosis was first reported in swine by Farrell and associates in Ohio (9). Eleven animals were involved, all of which came from one herd where a recurring undiagnosed disease had existed for many years. Parasites resembling *Toxoplasma* were first observed in pathological sections of a gilt which had died of the disease. Thereafter, similar organisms were seen in 7 additional pigs, 2 of which had died, and the others of which had been destroyed. Suspensions of tissues from eight affected pigs were inoculated into mice. The organs used for these isolation studies were brain, heart, lung, pooled liver and spleen, mesenteric lymph node, and kidney. The pooled liver and spleen inoculum from one pig and the heart of a second pig produced toxoplasmosis in recipient mice. The organisms were identified biologically and immunologically as *Toxoplasma*.

One healthy pig from another farm was inoculated with mouse tissues containing this porcine strain of *Toxoplasma*. At one month, the dye test titer of this animal was 1:160, and toxoplasmas were isolated from its tissues by mouse inoculation. The parasite was also found pathogenic for 2 more healthy pigs, 2 dogs, and 87 mice. In a second report from Ohio,

Sanger and Cole stated that they had isolated *Toxoplasma* from some pigs of a naturally infected sow (36). Also, the parasite was reported found in the milk of 2 naturally infected sows and 1 experimentally infected gilt, and from the placentas of 2 experimentally infected gilts.

Another outbreak of toxoplasmosis has recently been reported in swine in Norway by Momberg-Jorgensen (37). Eleven piglets were involved in this epidemic. In neither this nor the Ohio reports were the hog-feeding practices on the affected farms mentioned.

In addition to these reports, Weinman and Chandler have presented experimental and observational evidence representing an apparently impressive indictment of the pig as a source of human infection (38, 39). In the first study they fed seven young pigs repeatedly with tissues from mice and rats infected with the RH strain of *Toxoplasma*. In two of these pigs, toxoplasmas were later isolated from the brain; in a third the blood was infective to mice on the seventh day after feeding. The other four pigs were all negative in mouse inoculation tests, but there were some increases in dye test titers. Unfortunately, it is not clear from their report whether or not muscle of these pigs was tested for the presence of parasites. However, in another experiment reported in the same paper, they studied an additional seven pigs, all of which they inoculated with millions of parasites (38).

One infection of a 15-pound pig ended fatally in 6 days following intracardiac inoculation. In this case, it was reported that toxoplasmas were isolated from ham as well as from brain, heart, lung, liver, and spleen. Three of the other pigs which received these parenteral inoculations were examined for the presence of parasites. In one, the brain was found positive; in another, the blood on the 6th day and the lung on the 42d day; the 3d was negative. Again, no mention was made of whether or not other tissues, such as striated muscle, were tested. Older animals were regarded as less susceptible to infection; the pig found negative after parenteral infection was 4 months old when first used.

In their second paper, Weinman and Chandler report on finding 42 percent positive for

However, it is hardly acceptable in the experimental studies where calves were inoculated with materials from infected mice. It is unclear from the paper whether all the isolations were made from the calves which died of experimental infection, or from those which survived.

Obviously, more work must be done on toxoplasmosis in swine and cattle. Experimental data are needed on the distribution of parasites in the muscles of pigs and cattle following inoculation with small numbers of parasites and in the absence of symptoms. Survey data are necessary on the presence of *Toxoplasma* pseudocysts in meat bought at market. Even if meat is involved, we certainly require considerable new information to explain the other means of transmission which must exist.

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Studies conducted in the Laboratory of Tropical Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Public Health Service, subsequent to the preparation of this discussion have recently led to the development of a technique for the survey of meat samples to detect *Toxoplasma*. The parasite has been isolated from diaphragm muscle of 11 of 50 pigs slaughtered at a Baltimore abattoir. A similar survey is being conducted on beef (42).

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we cannot presume that toxoplasmas persist in the skeletal muscle of pigs merely because they have been found in the brain or lung. Furthermore, the finding of infected muscle in an animal dying of acute toxoplasmosis on the sixth day following intracardial inoculation of large numbers of parasites is not adequate evidence for presuming that parasites become distributed throughout the muscle of pigs with asymptomatic infections. Finally, repeated feedings or inoculations of heavily infected material do not duplicate natural conditions. Experimental studies should be prosecuted with smaller inoculums.

In connection with toxoplasmosis in cattle, the report of Sanger and associates concerned four herds in Ohio (10). A 4-year-old cow from one herd, which reacted positive to the toxoplasmin skin test, was killed 14 days after she bore a calf. She had no visible illness, and no organisms were recovered by mouse inoculations from heart, brain, liver, spleen, ovary, lymph nodes, adrenals, or skeletal muscle. Microscopic bodies, considered *Toxoplasma*, were, however, reported seen in the uterine wall, spleen, and lung; and 1 of 8 mice inoculated with colostrum from the right front teat developed toxoplasmosis. None of eight mice inoculated with colostrum from the other teats became infected. The calf was killed following birth, and one mouse inoculated from it died of toxoplasmosis; it is not clear from the report which of the organs used, brain, heart, liver, spleen, mesenteric node, or kidney, was the source of the infection. Toxoplasmas were found only in the liver on microscopic examination. In the same herd, 3 cows between 3½ and 5 years of age developed nervous disturbances and died, but no infections could be found in them. Also, of 31 calves born in this herd, 3 were born dead, and 4 developed an obscure illness from which 2 died. No evidence of infection was found in them.

In a second herd, there was a history of continual sickening and death of newborn calves. The symptoms were dyspnea, coughing, sneezing, nasal discharge, and frothing at the mouth, trembling, shaking of the head, dehydration, and occasionally diarrhea with blood and mucus. Forty-five of 78 calves died between the ages of 1 day and 6 months. One 4-week-old

calf was killed and its tissues tested by mouse inoculation. Brain, heart, liver, lung, spleen, kidney, pericardial fluid, and cerebrospinal fluid were inoculated separately into mice. Toxoplasmas were recovered in mice inoculated from the lung but not from the other organs. Histologically, toxoplasmas were reported in lesions of the brain, lung, and bronchial lymph node.

In the third herd, one bull developed anorexia, weakness, ataxia, prostration, chewing movements, and bicycling. It died 1 week after onset of illness. Microscopic examination revealed both free and intracellular organisms identified as *Toxoplasma* in the brain.

In the fourth herd, a 7-year-old cow died 2 weeks after parturition. The symptoms were anorexia, diarrhea, depression, fever, and mastitis. *Toxoplasma* was demonstrated microscopically in the lungs, myocardium, pericardium, kidney, gastric lymph node, and stomach; apparently no mouse inoculations were attempted. Some calves in this herd later died of an undiagnosed illness.

In an attempt to determine if *Toxoplasma* alone could be responsible for the symptoms seen in these herds, Sanger and his co-workers inoculated, by various routes, four healthy calves 4 to 90 days old with infective material from mice. Two control calves received a Seitz filtrate of the inoculum. The four test animals developed respiratory and nervous system disease similar to that previously observed. Two died and two recovered. Organisms identical with those seen in spontaneous cases were found microscopically in the lung, brain, liver, and spleen of 3 of the calves, and toxoplasmas were isolated from tissues of 2 of them.

The isolation of toxoplasmas only from the colostrum of a cow, even though the parasites were seen microscopically in other organs, is surprising. It is generally easier to isolate parasites than to detect them in sections. Perhaps this result is explainable on the basis that the inoculations and sections were done from widely separated pieces of the organs; or that strains of *Toxoplasma* in cattle are not well adapted for growth in mice.

This latter postulate could also serve to explain the other isolation failures when organisms could be demonstrated histologically.

However, it is hardly acceptable in the experimental studies where calves were inoculated with materials from infected mice. It is unclear from the paper whether all the isolations were made from the calves which died of experimental infection, or from those which survived.

Obviously, more work must be done on toxoplasmosis in swine and cattle. Experimental data are needed on the distribution of parasites in the muscles of pigs and cattle following inoculation with small numbers of parasites and in the absence of symptoms. Survey data are necessary on the presence of *Toxoplasma* pseudocysts in meat bought at market. Even if meat is involved, we certainly require considerable new information to explain the other means of transmission which must exist.

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Grants for Health Research Facilities

To encourage expansion of the Nation's health research facilities, the Public Health Service has approved 100 grants for the fiscal year 1958, on the recommendation of the National Advisory Council on Health Research Facilities. The grants, totaling more than \$26 million, were awarded to 77 institutions, including hospitals, universities, research institutes, and schools of medicine, dentistry, and public health in 30 States and the District of Columbia.

The awards open the second phase of a 3-year program authorized by the 84th Congress. Each year the program receives \$30 million "to assist in the construction of facilities for research in medicine, osteopathy, dentistry, and public health, and in fundamental and applied sciences when related thereto."

A total of 109 research facility grants to institutions in 31 States was previously awarded under the appropriations for fiscal 1957.

A Survey of X-Radiation Exposure in the Practice of Veterinary Medicine

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THE occasional appearance among veterinarians of cases of radiation exposure resulting in permanent disability of the hands has given rise to considerable speculation concerning the role of radiation as an occupational hazard of that profession. Nowhere have we seen this conjecture supported by a systematic study of actual radiation exposure conditions encountered in the practice of veterinary medicine. In keeping with the established program and policies of the radiological health program of the New Jersey State Department of Health this study has been developed to meet this need.

We did not construct our sample of New Jersey's veterinary population with an objectivity that would warm the heart of a rigorous biostatistician. We simply wrote to the approximately 350 licensed veterinarians in the State, described the field survey we wished to make, and invited their participation. We received favorable replies from 61 animal hospitals. We have no way of knowing the exact

number of veterinary X-ray installations in New Jersey, but we have fair reason to believe that 61 represents about one-half. If the 61 typify the profession with respect to X-ray usage, then our survey findings will be representative of prevalent conditions. It is necessary to express a word of caution in this respect. It is quite possible that those who replied may be the ones who are most apprehensive of the harmful effects of radiation; they consequently may use radiation equipment less frequently and with more caution than the veterinary population as a whole. To the extent that this is true our estimates of radiation exposure will be in error and, unfortunately, not in a conservative direction.

One advantage of this invitation approach to the survey was that all of the participants were happy to see us and were cooperative and hospitable. Many were amazed that the New Jersey State Department of Health offered such a service. All inquiries were answered frankly, even such questions as, "I see you have leaded aprons and gloves, Doctor, but do you wear them?"

In all, we visited 54 animal hospitals out of the 61 replying. The facilities are used by about 90 veterinarians. Our survey personnel made joint visits to the first six hospitals to assure the use of standard procedures in later surveys. We sought in these visits information on the type of X-ray facilities used, the

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frequency and manner of their use, protective devices and techniques, and the expected radiation exposure of the veterinarian and his assistants.

Facilities and Their Use

Of the 54 animal hospitals surveyed, 33 use radiographic X-ray alone, that is, no fluoroscopy. The majority of the veterinarians visited have fluoroscopic equipment also but never use it. The principal reason given for disuse was fear of excessive radiation exposure. Some men also asserted the value of having a permanent record of all radiographic examinations. Eight of the 54 hospitals use fluoroscopy only. Veterinarians at those hospitals praised the versatility of fluoroscopy and the saving of the time and expense required for taking and developing X-ray pictures. The remaining 13 hospitals employ both techniques.

Only two of the hospitals surveyed use the X-ray machine for therapy, but several other veterinarians expressed the intention of employing their equipment for this purpose in the near future.

About three-quarters of the X-ray units surveyed have a maximum current setting of 15 milliamperes and a peak voltage setting of 80 kilovolts. Three machines have unvariable settings. The remainder, consisting generally of newer machines, permit either 30 ma. or 50 ma. maximum current.

Only one hand fluoroscope was discovered. Happily that murderous device is retained by its owner for its antiquarian value only.

We have estimated from the data given us that the average frequency of use of the X-ray machine by veterinarians in this study is about 5 times a week. The average use of fluoroscopy is probably 2 to 3 times a week, with a weekly viewing time of perhaps 20 to 30 seconds. Far beyond all other factors, infrequent use of the equipment tends to keep veterinarians' exposure to radiation within accepted limits. Many of the techniques observed, if employed by a full-time radiologist or in a busy X-ray clinic, would create gross overexposure of personnel. If the X-ray usage by any veterinarian substantially exceeds the average found in this study, then, of course, he is more likely to receive greater exposure.

Protective Devices

All but two of the veterinarians visited have leaded aprons and gloves. About one-fourth, however, admitted that they seldom if ever wear them. Many times only one apron is available even though both the veterinarian and an assistant are simultaneously exposed. The gloves are worn less frequently than the apron. The veterinarians asserted that the bulkiness of leaded gloves makes positioning of a small animal, and palpation during fluoroscopic examination, difficult if not impossible.

In approximately one-fourth of the installations surveyed, a partially or completely lead-shielded cabinet is provided below the table to house the X-ray tube during fluoroscopy. The remaining three-fourths of the hospitals visited use an unshielded cabinet or, more frequently, an ordinary open table. In five study cases the veterinarian has provided himself with a lead shield behind which he stands when the machine is in operation. In only one instance is the X-ray remotely operated from a fully shielded control room.

One-fifth of the machines surveyed either have no external cone, or the cone used is so large that it is completely ineffectual from the point of view of protection. The principal reason for coning in most X-ray installations is to prevent avoidable scatter which tends to fog the X-ray film. However, under the conditions of use that prevail in most veterinarians' offices, coning is of considerable importance in minimizing radiation exposure to the operator. The difference in exposure with and without proper coning is described under the category "exposure estimate."

Somewhat the same point can be made concerning X-ray filters: they are useful in preventing unnecessary exposure to the operator although this is not usually their essential purpose. A filter removes from the useful beam X-rays of such low energies that they will not penetrate tissue to reach the film anyway. In X-raying humans, filtration is employed to limit useless exposure of the patient. In veterinary radiography, filtration reduces exposure of the operator since he is close to and occasionally within the direct beam. X-ray tubes possess some inherent filtration, a quantity we were unable to measure. For the great

majority of X-ray tubes inherent filtration is not adequate. We are inclined to recommend the addition of a least 1 mm. aluminum external filtration for all tubes.

In 2 of the 21 survey hospitals that use fluoroscopy, a leaded rubber curtain, suspended from the screen to the table top, shields the viewer from scatter radiation.

Techniques

The great majority of veterinarians anesthetize most of the animals before X-raying them. In many instances, however, anesthesia is omitted if a picture is to be made of an extremity of a docile, controllable animal. Neither is it used when the animal's health is considered too precarious to support the toxic effects of the anesthetic. In some of these latter instances the animal is narcotized. These practices simplify but do not eliminate the holding of the subject in the hand. Even if the animal is asleep or narcotized, in almost all cases someone holds it in the proper position for the desired picture. A small minority of the veterinarians use sandbags and other props for positioning the animal. Some men request the owner to hold the cat or dog, on the theory that one-time exposure for the owner is far less objectionable than repeated exposure for the veterinarian and his technician or handler. Of course, in many instances the animal is left at the doctor's office for diagnosis and treatment, and the owner is not present when the X-ray is taken. The majority of animals are manually positioned by the veterinarian or his employee.

One disturbing observation made in the field visits is the lack of standardization in the selection of various X-ray factors such as current, voltage, time, and distance. It is, of course, understood that some variation of these factors is possible without sacrificing picture quality but surely not to the extent encountered.

Among the veterinarians the distance from tube target to the film varies from 20 inches to 36 inches; in virtually all installations the dimension, once selected, is never varied. Differences in voltage, current, and time selections for comparable radiographs are considerable. Radiation dose delivered to animals for pic-

tures of equivalent tissue depth may range from 100 to 500 milliroentgens. This disparity is reflected in such variation of picture quality that some operators are obviously not gaining the full advantage of X-ray as a diagnostic aid. The art of obtaining maximum picture definition and contrast is not in our province, and, generally, we scrupulously avoided offering recommendations in this connection. However, X-ray factor selection is in our field of interest when improper settings require two or more X-rays where one would suffice, and when the delivered X-ray dose is considerably larger than is required for good picture quality.

The procedure usually employed in changing the voltage and current to new settings for different tissue thicknesses makes our attempts to determine average equipment usage highly unrealistic in many cases. An X-ray machine may be operated to an extent equivalent to 4, 5, or more exposures in the process of adjusting the current and voltage to desired levels. In only three instances the operator was observed to push the X-ray tube down flush with the table surface of a completely shielded fluoroscope cabinet so as to contain radiation issued during test procedure. As mentioned earlier, many installations are not equipped with such a cabinet; in these cases testing simply adds to the weekly X-ray workload.

Exposure Estimate

In all of our regular field appraisals of radiation exposure, we are guided by the recommendations of the National Committee on Radiation Protection, published in handbooks of the National Bureau of Standards. For persons occupationally exposed, the committee has suggested a maximum permissible radiation dose of 300 mr. a week for irradiation of the whole body and 1,500 mr. a week for irradiation of the hands alone. These maximum levels are generally accepted in the field of radiological health.

On all our field visits in this study and elsewhere, we have insisted that no one should feel cheated if he does not get his allowable radiation dose for the week. All ionizing radiation produces tissue destruction; some of this destruction is irreversible. The concept sup-

porting a maximum permissible dose is that cumulative tissue damage is not likely to be appreciable in the course of a man's life if exposure is kept below this limit. However, the pathological effects of radiation are not precisely predictable. Nor can we know with any certainty in what manner or to what extent the genetic effect of radiation can or will transmute the progeny of exposed persons or, in turn, their offspring. These doubts support the contention that all unnecessary radiation exposure is excessive.

To corroborate the exposure determinations made by instrument survey, we distributed to all participating veterinarians and their technicians radiation-monitoring film badges to be worn when using the X-ray machine for, in most cases, two consecutive 1-month periods. It was our intention to obtain a measure of actual radiation dose received by veterinarians under typical operating conditions. For the time that the badges were worn, each veterinarian was requested to keep a complete record of the exposure time and factor settings on his machine. The results of the film badge project were provocative if not completely satisfactory. We feel that this useful procedure should be carried on for a longer survey period, personnel and equipment permitting.

Badges were lost. Some veterinarians neglected to wear their badges when using the X-ray machine. So much delay was encountered in getting the veterinarians to return the badges that many badge readings are considered unreliable. In all, 161 badges were processed by a commercial contractor. Allowance was made for the energy dependence of film in converting densities to radiation exposure. The following table gives the exposure in milliroentgens per month:

| Milliroentgen/month range | Number of badges |
|---------------------------|------------------|
| 0 ----- | 64 |
| 1-100 ----- | 62 |
| 100-200 ----- | 14 |
| 200-500 ----- | 11 |
| 500-1,000 ----- | 3 |
| 1,000-2,500 ----- | 3 |
| Over 2,500 ----- | 4 |
| Total ----- | 161 |

The film data show that most of the veterinarians participating in this study at the time

they were monitored did not receive, on the average, a weekly radiation dosage in excess of the generally accepted limit of 300 mr. Seven badges of the 161 showed a weekly exposure of more than a 300 mr. One man received a monthly dosage of 30, 1.7, and 2.5 roentgens for three consecutive months. Another man using the same machine received 2.6, 5.3, and 0.3 roentgens for the same monthly periods. Our inspection revealed that the machine had no cone and was employed to an extent considerably in excess of the average usage in this survey.

In general, we are reluctant to accept the preceding data as descriptive of exposure conditions in the practice of veterinary medicine. Since individuals often forgot to wear the badge, and in most cases when worn it was clipped near the left breast pocket, we feel that badge readings tended to indicate a minimum possible exposure. We consider the information obtained by instrument survey to be more reliable.

We made three types of radiation measurements in the instrument survey: direct beam radiation doses, scattered radiation dose in the operator's position, and radiation rate at selected sites in the vicinity of the machine. A Victoreen Condenser-R meter and a Tracerlab-SU-1F were used for these measurements.

If a man standing immediately adjacent to the X-ray table operates a properly coned X-ray tube at 70-kv. peak and 15 ma. in radiography, he will receive, on the average, scattered radiation amounting to 3-5 mr. per second. If the tube is not coned he is likely to receive 10 times this dose, or 30-50 mr. per second. If his hands are in the direct beam, they will receive approximately 250 mr. per second. If the table is not shielded and the operator stands next to it, as did the majority of the veterinarians observed, his feet are likely to be within the direct beam, receiving an exposure of approximately 50 mr. per second.

Using the X-ray without proper coning, employing an unshielded table, and holding the animal with the hands in the direct beam are the three conditions which cause the most severe exposure in veterinary radiography. If these practices were avoided, approximately

fifty 1-second exposures per week could be made before the operator's exposure reached the limit of 300 mr. It should be emphasized that these are typical values as measured in a number of veterinary radiographic installations and cannot be considered to apply to all radiographic installations, veterinary or otherwise.

In operating a fluoroscope at 60-kv. peak and 5 ma., scattered radiation in the position of the viewer is approximately 1 mr. per second. If the hands are introduced into the direct beam after subject absorption, to move or palpate the animal, they will receive a dose of about 250 mr. per second. Three veterinarians informed us that their hands had received a disabling dose of radiation. They attributed the exposure to work done in years past with bare hands under the fluoroscopic screen.

In 10 installations the inadequacy or lack of coning permitted the direct radiation beam to overlap the screen and strike the face of the viewer. In such a case approximately 2 seconds of viewing will cause radiation exposure in excess of the suggested limit for the week.

Radiation rate measurements made at the operator's knee level during fluoroscopy reveal scatter radiation of approximately 2,500 mr. per hour. For those installations with a shielded cabinet, this level is about 5 mr. per hour, indicative of a reduction by a factor of 500. Dose readings made on the operator's side of a leaded rubber curtain suspended from the fluoroscopic screen were virtually zero for 10 seconds of viewing time.

Although other radiation measurements were made for various types of machines and conditions of operation, the data gleaned are too detailed for suitable presentation in a summary report. Some mention should be made, however, of the relationship of exposure and the use of leaded aprons and gloves. It is difficult to state with any accuracy the degree of protection afforded by these garments. If they contain one-half millimeter of lead, they will reduce the high energy component of 75-kv. peak X-ray by a factor of 7 to 10. They will exclude the lowest energy component. Their net effect

upon a radiation beam of mixed energies, such as is produced by an X-ray machine, is to provide a reduction in exposure by a factor of more than 100.

Any exposure an X-ray operator receives as a result of failing to wear a leaded apron is both avoidable and useless and is excessive in the purest sense of the word.

Summary Recommendations

For veterinarians employing X-ray and fluoroscopic equipment under average conditions of workload and use encountered in this survey (less than 10 milliamperes-minutes per week), we have the following recommendations:

- Always wear a leaded apron when using the X-ray or fluoroscope.
- Wear leaded gloves when hands are in the vicinity of the direct beam.
- When possible, anesthetize subject animals and use props to position them for radiography.
- Restrict radiation dose to the lowest level consistent with good picture quality and screen image visibility. Dark-adaptation of the operator's eyes will aid the latter.
- House the X-ray tube in a shielded cabinet for fluoroscopy.
- Suspend a leaded rubber curtain from the fluoroscopic screen to the table top on the side where the viewer stands.
- Always use a cone or diaphragm that will restrict the useful beam to the film size used.
- Never hold the animal to be radiographed with hands in direct beam.
- Provide at least a 1-mm. aluminum external filter for all X-ray tubes.
- When testing for desired factor settings, push the X-ray tube down flush with the table surface of the shielded fluoroscope cabinet.
- Provide a cone or diaphragm for fluoroscopy that will give an unilluminated area at least one-quarter inch wide around the entire periphery of the screen. Fix the motion of the screen to the tube in order to prevent removal of the screen from the direct beam.

comparison of

COMPLEMENT FIXATION TESTS

for

coccidioidomycosis

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THE VALUE of serologic tests in the diagnosis and prognosis of coccidioidomycosis has been established in long-term studies at the University of California School of Public Health (1, 2). Prognostically, a serum titer greater than 1:16 in the quantitative complement fixation test has indicated increased likelihood of dissemination of the infection. Complement-fixing titers have exceeded this "critical" level in serum samples from three-fifths of more than 700 patients with disseminated disease and from five-sixths of approximately 300 patients with extensive disseminations other than meningitis. On the other hand, in serum samples from more than 3,000 patients with primary nondisseminated disease, complement-fixing titers exceeding 1:16 have been observed in less than one-tenth.

These diagnostic and prognostic values have been determined by a single complement fixation technique. Not all laboratories, however, routinely use the same procedure. Since optimal utilization of serologic tests for coccidioidomycosis will be favored if laboratories can use, without modification, the techniques in which they are skilled (3), it is important to determine whether other complement fixation

techniques are diagnostically applicable. In particular, it is important to learn whether they alter the prognostic use of the critical titer.

Therefore, in 1948 a study was initiated to evaluate the consistency of five techniques of complement fixation. A corollary purpose was to determine the applicability of a positive control serum standardized to approximate the

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titer critical for dissemination. Collaborating with the University of California School of Public Health in this study were the Rocky Mountain Laboratory of the Public Health Service, the Army Medical Service Graduate School (now the Walter Reed Army Institute of Research), and the Fort Miley Veterans Administration Hospital. The investigations were sponsored by the Commission on Acute Respiratory Diseases, Armed Forces Epidemiological Board, which is supported by the Office of the Surgeon General, Department of the Army.

Method of the Study

The serum samples tested were specimens sent to the University of California School of Public Health for serologic tests for coccidioidomycosis. After an initial test, appropriate specimens of sufficient volume were divided into five equal parts. Three were sent as unknowns to the collaborating laboratories and two were retained.

Serums of persons without coccidioidal disease and of patients having various clinical forms of the infection were included in each set of unknowns. Using a 1:8 dilution of lot 47-54 of the previously described antigen (1), each collaborating laboratory performed quantitative complement fixation tests by the method it routinely uses. The University of California tested the specimens a second time with the original technique of binding for 2 hours at 37° C. and simultaneously with 18-

hour 4° C. binding. The five methods are outlined in table 1. The collaborating laboratories returned the results to the University of California for tabulation. Only specimens with four plus (++++) values were considered positive.

The study was continued for 4 years, during which time a total of 508 human serum samples were submitted to each collaborator. These were derived from a group of 18,500 specimens (2) with serologic patterns similar, except for slightly higher titers in all varieties of the infection, to those of the 21,000 specimens described in the initial report (1). Unfortunately, many tubes were broken or the serums became anticomplementary during transit. Consequently, the numbers actually tested by the different methods varied. However, a total of 206 specimens were tested by all five methods.

Specificity

Forty of the 508 specimens were from individuals known not to have coccidioidal infection. Seventeen were satisfactorily tested by all five methods. Only a single specimen was reported as positive by one laboratory (titer, 1:256).

Comparison of Titers

The comparison of titers obtained with the various techniques of complement fixation is based on analysis of the 206 serum samples tested by all five methods.

Table 1. Methods used by collaborating laboratories in performing complement fixation tests for coccidioidomycosis

| Laboratory | Number of units of complement | Binding | | Hemolytic system | | |
|--|-------------------------------|--------------|----------------------------------|------------------|----------------------------------|---------------------|
| | | Time (hours) | Temperature (degrees centigrade) | Time (hours) | Temperature (degrees centigrade) | End point (percent) |
| University of California ¹ | 2 | 2 | 37 | 1 | 37 | 100 |
| University of California..... | 2 | 18 | 4 | 1 | 37 | 100 |
| Rocky Mountain Laboratory..... | 2 | 1 | 37 | 1 | 37 | 100 |
| Fort Miley Veterans Administration Hospital..... | 4 | 18 | 4 | 1/2 | 37 | 50 |
| Army Medical Service Graduate School..... | 3 | 18 | 4 | 1/2 | 37 | 50 |

¹ The method also of the initial test, references 1 and 2.

Table 2. Factors of comparison and percentage agreement among five methods of coccidioidal complement fixation

| Method | Factor of comparison | Percentage agreement |
|---|----------------------|----------------------|
| U. of C. 2-hr. 37° C. with original U. of C. 2-hr. 37° C. | Same----- | 94 |
| U. of C. 2-hr. 37° C. with U. of C. 18-hr. 4° C. | 2-fold increase. | 93 |
| U. of C. 2-hr. 37° C. with RML 1-hr. 37° C. | 2-fold increase. | 88 |
| U. of C. 2-hr. 37° C. with Fort Miley 18-hr. 4° C. | 2-fold increase. | 76 |
| U. of C. 2-hr. 37° C. with Army 18-hr. 4° C. | 5-fold increase. | 88 |
| U. of C. 18-hr. 4° C. with Fort Miley 18-hr. 4° C. | Same----- | 80 |
| U. of C. 18-hr. 4° C. with Army 18-hr. 4° C. | 2½-fold increase. | 88 |

The results of the original test and those of the repeat test at the University of California using the 2-hour 37° C. technique show agreement of 94 percent when the usual allowance is made for a variation of one serial dilution. However, even this difference demonstrates the importance of repeating the complement fixation test of a previous specimen concurrently with a new specimen. Otherwise, prognostically significant changes may be wrongly inferred.

Comparison of the simultaneous tests with 2-hour 37° C. binding and with 18-hour 4° C. binding at the University of California indi-

cates a consistent shift one serial dilution higher in the latter. Again there is agreement of 94 percent within a one-serial-dilution variation.

The 1-hour 37° C. technique of the Rocky Mountain Laboratory also produces titers one serial dilution higher than those of the University of California's 2-hour 37° C. method. For these two methods, agreement is 88 percent when a variation of one serial dilution is allowed.

The method of the Fort Miley Veterans Administration Hospital, in which 18-hour 4° C. binding and four 50-percent units of complement are used, results in slightly greater scattering of titers than the 2-hour 37° C. method. A relatively large number of specimens found positive by other methods were negative by the Fort Miley technique. Nevertheless, agreement at one serial dilution higher than the University of California's values is 76 percent.

Use of three 50 percent units of complement and an overnight period at 4° C. for fixation, the method of the Army Medical Service Graduate School, results in titers 5 times higher than the University of California's two 100-percent units of complement and 2-hour 37° C. binding. Agreement between these two techniques is 88 percent.

Since the Fort Miley and the Army techniques both include 18-hour icebox binding, the results obtained with these two methods have been compared with those obtained with similar

Table 3. Percentage distribution of maximal complement-fixing titers in serums of patients with primary coccidioidal infection: comparative results of six tests

| Maximal titer of complement fixation, other than Army | U. of C. 2-hr. 37° C., concurrent series (percent of 1,365 patients) | U. of C. 2-hr. 37° C. (percent of 109 patients) | U. of C. 18-hr. 4° C. (percent of 142 patients) | RML (percent of 103 patients) | Fort Miley (percent of 84 patients) | Maximal titer of complement fixation, Army | Army (percent of 112 patients) |
|---|--|---|---|-------------------------------|-------------------------------------|--|--------------------------------|
| 2----- | 42 | 46 | 13 | 26 | 27 | 5 | 18 |
| 4----- | 23 | 22 | 27 | 29 | 26 | 10 | 23 |
| 8----- | 16 | 14 | 28 | 15 | 23 | 20 | 30 |
| 16----- | 10 | 11 | 15 | 10 | 10 | 40 | 13 |
| 32----- | 7 | 2 | 13 | 10 | 8 | 80 | 9 |
| 64----- | 1 | 3 | 1 | 4 | 3 | 160 | 5 |
| 128----- | 1 | 1 | 2 | 2 | 2 | 320 | 1 |
| 256----- | (0.3) | 1 | 1 | 4 | 1 | 640 | 1 |
| <32----- | 91 | 93 | 83 | 80 | 86 | <80 | 84 |
| <64----- | 98 | 95 | 96 | 90 | 94 | <160 | 93 |

Table 4. Percentage distribution of maximal complement-fixing titers in serums of patients with coccidioidal pulmonary residuals (with and without cavities): comparative results of six tests

| Maximal titer of complement fixation, other than Army | U. of C. 2-hr. 37° C., concurrent series (percent of 384 patients) | U. of C. 2-hr. 37° C. (percent of 47 patients) | U. of C. 18-hr. 4° C. (percent of 48 patients) | RML (percent of 40 patients) | Fort Miley (percent of 31 patients) | Maximal titer of comple- ment fix- ation, Army | Army (percent of 41 patients) |
|---|---|---|---|---------------------------------------|---|---|--|
| 2 | 56 | 49 | 35 | 38 | 39 | 5 | 10 |
| 4 | 25 | 26 | 23 | 18 | 29 | 10 | 22 |
| 8 | 10 | 13 | 21 | 10 | 20 | 20 | 27 |
| 16 | 6 | 6 | 10 | 22 | 6 | 40 | 19 |
| 32 | 3 | 6 | 9 | 8 | 6 | 80 | 17 |
| 64 | 0 | 0 | 2 | 2 | 0 | 160 | 2 |
| 128 | 0 | 0 | 0 | 2 | 0 | 320 | 3 |
| 256 | 0 | 0 | 0 | 0 | 0 | 640 | 0 |
| <32 | 97 | 94 | 89 | 88 | 94 | <80 | 85 |
| <64 | 100 | 100 | 98 | 96 | 100 | <160 | 97 |

fixation at the University of California. The latter, as one recalls, yields titers one serial dilution higher than does the standard 2-hour 37° binding. Also, the titers at Fort Miley are one serial dilution higher than those of the University of California's standard technique. Thus, it would be expected that the Fort Miley test and the University of California's overnight test would produce titers of the same level. This assumption has been found to be correct, with an agreement of 80 percent. By the same reasoning, results of the Army test should correlate with the results of the University of California overnight, icebox binding at a 2½-fold increase in titer. This, too, has been found to be true, with the excellent agreement of 88 percent.

The factors of comparison for the various techniques, together with the degree of agreement, are summarized in table 2.

Comparison of Prognostic Applications

As previously noted, experience at the University of California with the 2-hour 37° C. technique of binding complement has indicated that 1:16 is the titer critical for disseminated coccidioidal infection. The present study has shown that the results of four other techniques are consistently comparable with the results of the 2-hour 37° C. procedure. By use of the factors of comparison given in table 2, the

"equivalent" critical titers for these four techniques are estimated to be as follows:

| | |
|---|------|
| University of California 18-hour 4° C. | 1:32 |
| Rocky Mountain Laboratory 1-hour 37° C. | 1:32 |
| Fort Miley 18-hour 4° C. | 1:32 |
| Army 18-hour 4° C. | 1:80 |

The maximal titers of complement fixation in the serums from individual patients with primary coccidioidal infection are compared in table 3. The numbers tested by the different methods vary because of unsatisfactory (broken or anticomplementary) specimens. If multiple specimens from the same patient are included in the comparisons, only the maximal titer is indicated. Also shown in this table are the results of the entire series of specimens from patients with primary infection (designated "concurrent series") from which the samples for the comparisons were obtained. The cumulative percentage distributions at the respective critical titers indicate that these levels consistently include between 90 and 96 percent of the patients' serums.

Correlation among the five techniques for fixing complement is close also for patients with coccidioidal pulmonary residuals (with or without cavities), as shown in table 4. The previously reported studies revealed that serums of patients with this form of the infection fix complement at titers even lower than do those of patients with primary infection. In the present study, from 94 to 100 percent of the

patients' serums are no higher than the equivalent critical titers.

The characteristically high titers of complement fixation in serums of patients with dis-

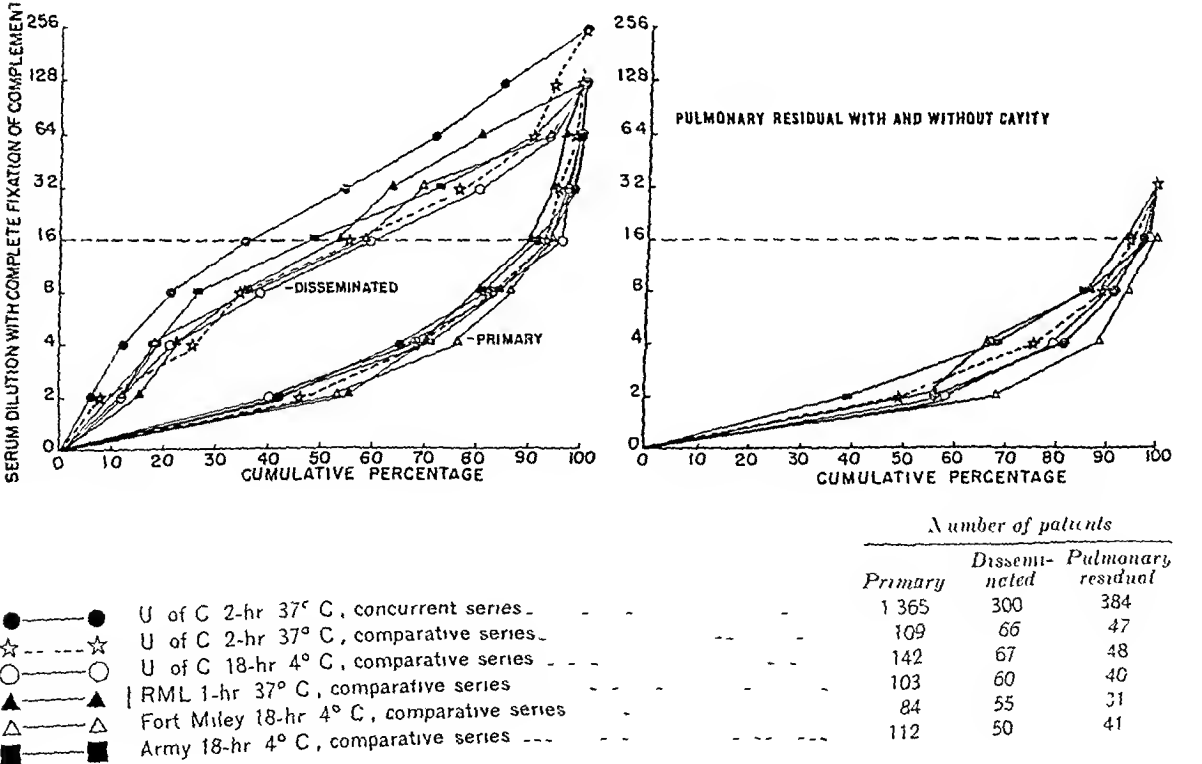
seminated disease are shown in table 3. The critical titers are exceeded in from 41 to 52 percent of the patients' serums.

The accompanying illustration shows the

Table 5. Percentage distribution of maximal complement-fixing titers in serums of patients with disseminated coccidioidal infection: comparative results of six tests

| Maximal titer of complement fixation, other than Army | U. of C 2-hr 37° C concurrent series (percent of 300 patients) | U. of C 2-hr 37° C (percent of 66 patients) | U. of C 18-hr 4° C (percent of 67 patients) | RML (percent of 60 patients) | Fort Miley (percent of 55 patients) | Maximal titer of complement fixation, Army | Army (percent of 50 patients) |
|---|--|---|---|------------------------------|-------------------------------------|--|-------------------------------|
| 2 | 6 | 8 | 3 | 10 | 7 | 5 | 2 |
| 4 | 6 | 17 | 9 | 5 | 5 | 10 | 4 |
| 8 | 9 | 9 | 9 | 7 | 6 | 20 | 12 |
| 16 | 11 | 21 | 17 | 13 | 18 | 40 | 8 |
| 32 | 19 | 21 | 21 | 18 | 22 | 50 | 22 |
| 64 | 17 | 14 | 21 | 10 | 11 | 160 | 24 |
| 128 | 13 | 6 | 13 | 17 | 24 | 320 | 18 |
| 256 | 16 | 4 | 7 | 20 | 7 | 640 | 10 |
| < 32 | 35 | 55 | 38 | 35 | 36 | < 80 | 26 |
| < 64 | 51 | | 59 | 53 | 58 | < 160 | 48 |

Cumulative percentage distributions of maximal complement-fixing titers for three types of coccidioidal infection: results of four methods adjusted to equivalence with the University of California 2-hour 37° technique.



cumulative percentage distributions of the maximal titers for the three categories of patients when the results of the four other methods are adjusted to equivalence with the results of the University of California 2-hour 37° C. procedure. In each category, all the distribution curves are remarkably similar. This finding further demonstrates that results obtained by a variety of complement fixation techniques are comparable, provided an index of equivalence can be devised. The contrast in the patterns of the curves in the nondisseminated and the disseminated infections also can be seen in this illustration.

For patients with disseminated disease, the titers of the comparative tests are not quite as high as those of the total concurrent series. A possible reason for this discrepancy is that specimens for the comparative study frequently have been selected from patients with earlier positive specimens. Although only the maximal titer is selected for a single patient, such repeat specimens characteristically come from less severely ill patients. Unfortunately, the volume of serums sent us from seriously ill patients who die of fulminating disease has been too small to permit use of these serums in the comparative tests. Thus the comparative series is weighted by patients with less severe disease whose serums have lower titers.

Standard Positive Control Serum

Laboratories performing complement fixation tests for coccidioidomycosis require a positive control serum. One feasible method for comparing the results of different techniques would be to have this positive control standardized at the critical level. Accordingly, Cutter Laboratories was supplied with suspensions of multiple strains of *Coccidioides immitis* in the mycelial phase. A series of horses was infected intravenously. After precipitin and complement-fixing antibodies had developed, the serums were harvested and pooled. Various dilutions were made with normal horse serum and, together with normal horse serums, sent out under fictitious names as part of the comparative testing of human serums.

The results obtained with the five complement fixation techniques are summarized in

Table 6. Titers obtained on various dilutions of horse serums by collaborating laboratories

| Dilution of serum | U. of C. 2-hr. 37° C. | U. of C. 18-hr. 4° C. | RML | Fort Miley | Army |
|-------------------|-----------------------------|-----------------------------|---------|------------|----------|
| Range of titers | | | | | |
| Undiluted | 32-256 | 64-256 | 128-256 | 64-256 | 640-1280 |
| 2 | 16-64 | 32-128 | 32-128 | 32-64 | 160-640 |
| 4 | 8-32 | 32-128 | 16-32 | 32 | 80 |
| 8 | 4-16 | 8-16 | 2-16 | 2-8 | 40-80 |
| 16 | 2-8 | 4-8 | 4-16 | 4 | 20 |
| 32 | 0-4 | 2-4 | 0-4 | 0 | 10 |
| 64 | 2 | 4 | 2 | ----- | 10 |
| 128 | 0 | 2 | 2 | ----- | 5 |
| 256 | 0 | 0 | 0 | 0 | 0 |
| Modal titer | | | | | |
| Undiluted | 64 | 128 | 128 | 128 | 320 |
| 2 | 32 | 64 | 32 | 64 | 160 |
| 4 | 16 | 32 | 32 | 32 | 80 |
| 8 | 8 | 16 | 16 | 8 | 40 |
| 16 | 4 | 8 | 8 | 4 | 20 |
| 32 | 2 | 4 | 4 | 2 | 10 |
| 64 | 0 | 2 | 2 | 0 | 5 |
| 128 | 0 | 0 | 0 | 0 | 0 |
| 256 | 0 | 0 | 0 | 0 | 0 |

table 6. Regardless of the method employed, the pooled horse serums diluted 1:4 approximate the critical titer. Each of the five sets of normal horse serums has been negative. Thus the objective of a standardized positive control serum appears to have been achieved. Bieberdorf (4), recognizing the necessity of a positive control serum for coccidioidal complement fixation, has proposed the use of lyophilized serum from infected rabbits. Use of the positive control serum in combination with the critical titer to provide an index of equivalence, as discussed above, appears more desirable. Also, a larger volume of appropriately standardized positive serum can be obtained from the horse.

Although Bieberdorf discusses the relative merits of the specificity of coccidioidal rabbit serum with antigens of *Histoplasma* and *Blasatomyces*, we believe that specificity in a serum control is not a primary consideration. The control is to be used in tests with coccidioidin as the only antigen. Thus the results will relate only to the titers of the serums that are tested with this substance. Campbell and

patients' serums are no higher than the equivalent critical titers.

The characteristically high titers of complement fixation in serums of patients with dis-

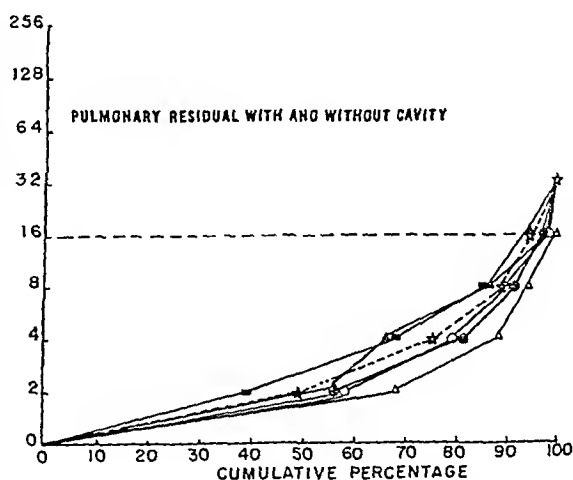
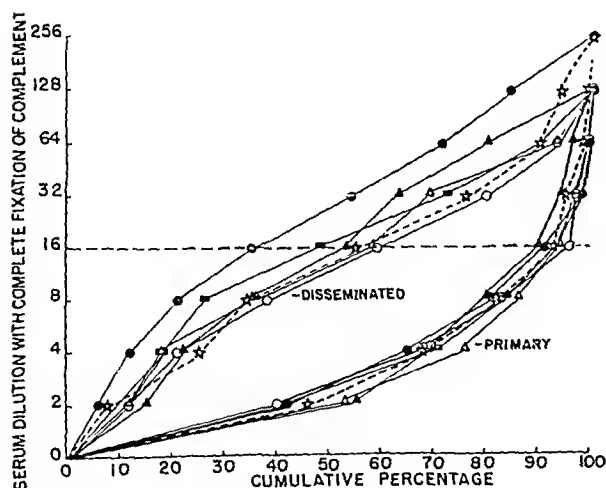
seminated disease are shown in table 5. The critical titers are exceeded in from 41 to 52 percent of the patients' serums.

The accompanying illustration shows the

Table 5. Percentage distribution of maximal complement-fixing titers in serums of patients with disseminated coccidioidal infection: comparative results of six tests

| Maximal titer of complement fixation, other than Army | U. of C. 2-hr. 37° C. concurrent series (percent of 300 patients) | U. of C. 2-hr. 37° C. (percent of 66 patients) | U. of C. 18-hr. 4° C. (percent of 67 patients) | RML (percent of 60 patients) | Fort Miley (percent of 55 patients) | Maximal titer of complement fixation, Army | Army (percent of 50 patients) |
|---|---|--|--|------------------------------|-------------------------------------|--|-------------------------------|
| 2 | 6 | 8 | 3 | 10 | 7 | 5 | 2 |
| 4 | 6 | 17 | 9 | 5 | 5 | 10 | 4 |
| 8 | 9 | 9 | 9 | 7 | 6 | 20 | 12 |
| 16 | 14 | 21 | 17 | 13 | 18 | 40 | 8 |
| 32 | 19 | 21 | 21 | 18 | 22 | 80 | 22 |
| 64 | 17 | 14 | 21 | 10 | 11 | 160 | 24 |
| 128 | 13 | 6 | 13 | 17 | 24 | 320 | 18 |
| 256 | 16 | 4 | 7 | 20 | 7 | 640 | 10 |
| < 32 | 35 | 55 | 38 | 35 | 36 | < 80 | 26 |
| < 64 | 54 | | 59 | 53 | 58 | < 160 | 48 |

Cumulative percentage distributions of maximal complement-fixing titers for three types of coccidioidal infection: results of four methods adjusted to equivalence with the University of California 2-hour 37° technique.



- — ● U. of C. 2-hr. 37° C., concurrent series
- ☆ — ☆ U. of C. 2-hr. 37° C., comparative series
- — ○ U. of C. 18-hr. 4° C., comparative series
- ▲ — ▲ RML 1-hr. 37° C., comparative series
- △ — △ Fort Miley 18-hr. 4° C., comparative series
- — ■ Army 18-hr. 4° C., comparative series

| | Number of patients | | |
|----|--------------------|--------------|--------------------|
| | Primary | Disseminated | Pulmonary residual |
| 1 | 365 | 300 | 384 |
| 2 | 109 | 66 | 47 |
| 4 | 142 | 67 | 48 |
| 8 | 103 | 60 | 40 |
| 16 | 84 | 55 | 31 |
| 32 | 112 | 50 | 41 |

Prevention of Secondary Attacks of Rheumatic Fever

WILLIAM J. ZUKEL, M.D.

BASIC research into the etiology and pathogenesis of rheumatic fever is still urgently needed, since it is from such knowledge that ultimate control of the disease will be possible. However, one of our greatest practical problems in rheumatic fever prevention is not a lack of preventive measures, but rather a lack of effective application of available preventive measures.

Many physicians have the impression that rheumatic fever is no longer an important health problem in the United States. They do not see many cases in their practice—the classical manifestations of rheumatic fever are less common than a decade ago and the symptoms may be so mild that they may pass unnoticed. Therapeutic measures have also become more effective so that fewer deaths result even from the more severe attacks.

This is encouraging progress, but a look at some facts will reveal that much effort is still needed to control this largely preventable disease (table 1).

In 1954, 1,297 deaths were reported from acute rheumatic fever and rheumatic carditis. Another 18,256 deaths resulted from the effects of chronic rheumatic heart disease. This contrasts with poliomyelitis which resulted in 1,368 deaths during that year. Like poliomyelitis, rheumatic fever is largely a crippling disease, and its impact results mainly from chronic disability and, later, death from chronic rheumatic heart disease. Certainly, more than 19,000 deaths each year from the acute and chronic effects of rheumatic fever leave little room for complacency. Every State in the United States reported deaths from rheumatic

fever and rheumatic heart disease in 1955. The age-adjusted death rates from rheumatic fever and rheumatic heart disease are as high in some southern States as in some northern States. However, in general, the death rates are higher in the Rocky Mountain areas, New England, and the Middle Atlantic States.

In approximately 30 States, rheumatic fever is a reportable disease. But if we considered the number of reported cases as a true index of the actual number occurring, we would be greatly misled. For example, a comparison of the reported deaths from acute rheumatic fever and rheumatic carditis (table 1) with the total number of reported cases of rheumatic fever (see below) during the years 1949 through 1955 would imply a fatality rate ranging from approximately 50 to 30 percent. This obviously is not consistent with clinical experience.

| Year | Number of cases |
|------|-----------------|
| 1949 | 4,457 |
| 1950 | 3,635 |
| 1951 | 3,883 |
| 1953 | 3,642 |
| 1954 | 4,230 |
| 1955 | 3,690 |

SOURCE: Worksheets, National Office of Vital Statistics.

Dr. Zukel is assistant director of the National Heart Institute, Public Health Service. His review was prepared while he was chief of Operational Research, Heart Disease Control Program, and was presented at the annual meeting of the Staff Conference of Heart Associations, 29th Annual Scientific Sessions of the American Heart Association, Cincinnati, Ohio, October 1956.

Salvin have both found markedly strong cross reactions in the horse serums when they use antigens of *Histoplasma capsulatum* and *Blastomyces dermatitidis*. However, these findings relate to the lack of specificity of these two heterologous antigens. The testing of human serums is a wholly different matter. In these complement fixation tests coccidioidin appears to have a relatively high degree of specificity. Nevertheless, as discussed earlier (2, 5), cross reactions in human serums should be kept in mind.

To investigate further the practicality of the general use of complement fixation tests for coccidioidomycosis, a second study with eight additional collaborating laboratories is now under way. Only 2 of the 13 complement fixation methods are alike. Thus this study is investigating not only the variations of complement fixation results which may be encountered but also the degree of consistency and reproducibility of the comparative values and whether the control horse serum can be successfully lyophilized at a standardized critical titer.

Summary

A study of five different techniques for performing quantitative complement fixation tests for coccidioidomycosis by four laboratories has revealed indexes of comparability. When these factors of equivalence are applied to the results of the complement fixation tests in various clinical types of coccidioidal infection, the titers follow the characteristic distribution curves of nondisseminated and disseminated infections irrespective of the technique used. The consistency of the results indicates that the quantitative complement fixation tests have general

prognostic as well as diagnostic applicability. An appropriately diluted serum from infected horses appears to set a "critical titer" above which dissemination is frequent and at and below which it is infrequent by whatever method is used. The investigation is now being extended to a larger number of laboratories.

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DOCUMENTATION NOTE

Seven tables presenting comparative results of the five methods of complement fixation have been deposited as document No. 5358 with the American Documentation Institute Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D. C. A photoprint copy may be obtained by remitting \$1.25; a 35-mm. microfilm copy by remitting \$1.25. Cite document number. Advance payment is required. Make checks or money orders payable to Chief, Photoduplication Service, Library of Congress.

heart disease. It is hoped that continuation of this study for the next few years will provide an index of the trend of prevalence of rheumatic heart disease in this selected population group.

Community Prophylaxis

Many studies in the past two decades have emphasized the relationship between beta hemolytic streptococcal infections and the subsequent development of rheumatic fever (8, 9). The number of reported cases of scarlet fever and streptococcal sore throat has actually increased in the last 5 years in the United States as shown below:

| Year | Number of cases |
|------|-----------------|
| 1949 | 87,220 |
| 1950 | 64,494 |
| 1951 | 84,151 |
| 1952 | 113,677 |
| 1953 | 132,935 |
| 1954 | 147,785 |
| 1955 | 147,502 |

SOURCE: Reported cases of specified notifiable diseases: United States 1945-54. Data for 1955 from pre-publication worksheet, National Office of Vital Statistics.

Practicing physicians and health officers should be alert to recognize outbreaks of streptococcal infections since effective measures for their treatment are now available. The need for community prophylaxis of streptococcal infections was pointed up by the recent resolution of the Association of State and Territorial Health Officers "That trials and further study of the use of penicillin in mass prophylaxis for the control of an outbreak of streptococcal infections be encouraged" (10). An excellent report of the experience in the prophylaxis of civilian streptococcal outbreaks in New York State has been made by Poskanzer and associates (11).

Prompt treatment of such streptococcal infections can largely prevent the subsequent development of rheumatic fever. The youngster who has had one attack of rheumatic fever is especially susceptible to recurrences if new streptococcal infections develop. Continuous prophylaxis with penicillin or sulfonamides is indicated for children with a known history of rheumatic fever since the risk of recurrence is

as high as 50 percent following such streptococcal infections, as shown in table 4 (12). Many streptococcal infections go undetected, however, and the first indication of trouble may be in the actual flareup of a new attack of rheumatic fever.

The classic study which reveals the risk of recurrent attacks of rheumatic fever and the natural history of the disease was done by Dr. E. F. Bland and the late Dr. T. Duckett Jones (13).

One thousand children who had had rheumatic fever were followed carefully for 20 years during the era before sulfa and penicillin prophylaxis. Approximately 20 percent of the children had a recurrent attack of rheumatic fever each year in the first 5 years from the date of the initial attack. Approximately 10 percent had recurrent attacks each year during the next 5 years, 5 percent in the third 5 years, and 1.5 percent in the last 5 years. Evidently the risk of recurrence is especially high in the years immediately following the initial attack, but attacks can occur at any time. Eighty percent of the deaths during this period were caused by recurrent attacks of rheumatic fever. This and other important studies support the strong recommenda-

Table 3. Reported prevalence of rheumatic heart disease in college students¹

| Source | University | Number examined | Percent with rheumatic heart disease |
|------------------------|--------------------------------|-----------------|--------------------------------------|
| Lee (1915)----- | Harvard students. ² | 662 | 1.5 |
| Paul and Leddy (1932). | Yale students ² --- | 7,914 | .8 |
| Wood (1932)----- | Yale students ² --- | 4,455 | 1.1 |
| | University of Pennsylvania. | 3,086 | 1.0 |
| Hedley (1938)----- | 86 universities----- | 101,163 | 1.2 |
| | 14 universities----- | 46,098 | .6 |
| Cole (1941)----- | University of Wisconsin. | 28,139 | .8 |
| Contratto (1943)--- | Harvard freshmen. ² | 2,856 | .3 |
| Shearer et al. (1952). | University of Colorado. | 3,615 | .7 |
| Goggio (1952)----- | University of California. | 11,096 | .3 |

¹ Modified from Shearer et al. (7).

² Males.

Table 1. Deaths from poliomyelitis, acute rheumatic fever and rheumatic carditis, and rheumatic heart disease, United States

| Year | Poliomyelitis (080) | Acute rheumatic fever and rheumatic carditis (400-402) | Chronic rheumatic heart disease (410-416) |
|-----------|------------------------|---|--|
| 1949----- | 2,720 | 2,304 | 20,434 |
| 1950----- | 1,904 | 1,924 | 20,392 |
| 1951----- | 1,551 | 1,648 | 19,988 |
| 1952----- | 3,145 | 1,583 | 19,734 |
| 1953----- | 1,450 | 1,523 | 19,587 |
| 1954----- | 1,368 | 1,297 | 18,256 |
| 1955----- | 1,043 | 1,150 | 18,760 |

NOTE: Numbers in parentheses are from the International Lists of Diseases and Causes of Death, sixth revision.

SOURCE: National Office of Vital Statistics, Public Health Service.

Rather, it probably indicates a large under-reporting of rheumatic fever cases. Perhaps a better indication of the under-reporting of rheumatic fever can be seen from a recently reported Minnesota study (1). The results of this survey are shown in table 2.

Approximately 200 cases of rheumatic fever were reported yearly by physicians in that State during 1950-54. In 1955 the Minnesota Department of Health and the Minnesota Heart Association conducted a special letter survey, asking each physician how many cases of active rheumatic fever he had treated during the preceding 12 months. The physicians reported that they had treated 2,297 cases during 1955. Although the accuracy of diagnosis was not verified, this is 10 times the number actually reported in previous years and is more than half the total number officially reported from over 30 States during that year.

The prevalence of rheumatic heart disease is not known, but it is conservatively estimated that approximately 1 million persons in the United States have been afflicted by this disease. Selected surveys of school children since 1945 have revealed a prevalence of rheumatic heart disease ranging from 0.2 to 4.6 percent of those examined (2,3). The statewide survey of sixth grade Colorado school children by Maresh, Dodge, and Lichty revealed that 0.67 percent have rheumatic heart disease (4).

In about 11½ million registrants between the ages of 18-25 examined by the Selective Service System in the years 1940-1944, 1.8 percent were found to have rheumatic heart disease or valvular heart disease (5).

A recent careful clinical study of a random sample of the adults in Framingham, Mass., a community of approximately 30,000 population, has revealed a prevalence of rheumatic heart disease in 2.4 percent of the population 30-39 years of age (6).

Surveys of college students (7) have found somewhat under 1 percent with rheumatic heart disease (table 3).

The American College Health Association and the Heart Disease Control Program of the Public Health Service began a cooperative study in the fall of 1956 to determine the trend of prevalence of rheumatic heart disease among entering freshman students. Student health service physicians of 132 colleges and universities are participating in this study. Preliminary data relating to a previous history of rheumatic fever and results of entrance physical examinations are now available for 65 colleges, representing 54,058 freshman students. A previous history of definite rheumatic fever was elicited in 1.2 percent of the students. An additional 0.9 percent had a history consistent with previous possible rheumatic fever.

Physical examination findings considered to be adequate for a diagnosis of definite rheumatic heart disease were present in 0.3 percent of entering freshmen. An additional 0.6 percent had findings diagnosed as probable rheumatic

Table 2. Minnesota rheumatic fever experience, 1950-55

| Year | Number cases reported | Number receiving prophylaxis |
|-------------------------|-----------------------|------------------------------|
| 1950 ¹ ----- | 162 | ----- |
| 1951 ¹ ----- | 170 | ----- |
| 1952 ¹ ----- | 221 | ----- |
| 1953 ¹ ----- | 235 | ----- |
| 1954 ¹ ----- | 148 | ----- |
| 1955 ² ----- | 2,297 | 3,323 |

¹ Cases reported yearly to Minnesota Department of Health.

² Special mail survey (1).

children out of this group could be said to have followed a satisfactory preventive regimen.

Essential Program Features

What are some of the essential features in a successful rheumatic fever prevention program? Perhaps most important is the sincere interest of physicians and community agencies in setting up an effective mechanism for maintaining a long-term prophylaxis program.

The problem of rheumatic fever prevention cannot be solved by physicians alone, by the patients alone, by the health department alone, or by the heart association alone. This is a problem that requires community interest and

cooperation. Planning such a program should be done with the cooperation of all the interested groups concerned. No blanket program will meet the needs of every community, but rather each community's individual needs, and its resources available to meet these needs, must be visualized in planning a program (see inset below).

Basic to any program plan is the continuing interest and support of the practicing physicians, parents, school nurses and teachers, public health nurses, and social workers. Each of these must believe in the value of what is being done and the importance of following the long-term regimen. If the physicians are not convinced, certainly it is hard to expect that

IMPORTANT PROGRAM ELEMENTS

cooperative planning
by interested community groups

- * Practicing physicians
- * Health department
- * Heart association

educational program
enlisting cooperation of

- * Physicians and clinics
- * Parents
- * School system
- * Public health nurse

diagnostic services
for problem cases

- * Cardiological consultation
- * Laboratory services

up-to-date register
maintained by health department

- * Focal point and responsible agency
for long-term followup

prophylactic penicillin

- * Low cost for nonindigent patients
- * Free for indigent patients

effective followup
plus services

- * Prevent lapses from medical supervision
- * Prevent lapses in prophylaxis
- * Provide nursing services, home teaching,
social services, other services as needed

Table 4. Frequency of rheumatic fever recurrences following proved group A streptococcal infections

| Treatment status | Number of streptococcal infections | Recurrences of rheumatic fever | |
|-----------------------------------|------------------------------------|--------------------------------|----------|
| | | Number | Per cent |
| Not treated with penicillin----- | 11 | 6 | 54 |
| Treated with oral penicillin----- | 25 | 2 | 8 |

SOURCE: Reference 12.

tions of the Committee on Prevention of Rheumatic Fever and Bacterial Endocarditis of the Council on Rheumatic Fever and Congenital Heart Disease (14). The committee recommends that children who have had rheumatic fever be maintained on a regimen of continuous prophylaxis indefinitely.

We know that continuous prophylaxis can reduce the rheumatic fever recurrence rate by well over 85 percent if conscientiously carried out (15, 16). Experience reveals that either oral sulfadiazine, oral penicillin, or benzathine penicillin administered intramuscularly can be effective (table 5). However, there have been more frequent breakthroughs of streptococcal infections on sulfadiazine and on oral penicillin than with intramuscular benzathine penicillin (17). An increase in the dosage of oral penicillin of 200,000 or 250,000 units twice a day is now being recommended by the Committee on

Table 5. Effect of prophylaxis on recurrences of rheumatic fever

| Prophylaxis status | Type of prophylaxis | | | | | |
|--------------------|---------------------|-------------------|----------|-----------------|-------------------|----------|
| | Sulfonamide | | | Oral penicillin | | |
| | Patient-years | Rheumatic attacks | | Patient-years | Rheumatic attacks | |
| | | Number | Per cent | | Number | Per cent |
| Control----- | 1, 697 | 238 | 14.0 | 932 | 81 | 8.7 |
| Prophylaxis----- | 1, 358 | 27 | 1.9 | 740 | 5 | .6 |

SOURCE: Modified from Stollerman (16).

Prevention of Rheumatic Fever and Bacterial Endocarditis in its revised prevention statement (14). These basic recommendations are sound and can be used in planning community rheumatic fever prevention programs.

Most States have some type of rheumatic fever program. Some of these have been in operation for many years. Since 1939, a great deal has been accomplished through the support of State rheumatic fever programs by the Children's Bureau, but there is still much to be done. We have not fully persuaded physicians, parents, and patients on the importance of preventing rheumatic fever recurrences. For example, the survey of college students that is now being carried on by the Heart Disease Control Program in cooperation with the American College Health Association is revealing a glaring lack of prophylaxis in the known cases of rheumatic heart disease either following the initial attack or at the present time. In these preliminary data, only 73 out of 659 college students with a known history of rheumatic fever are on any kind of prophylaxis. We certainly cannot say we have succeeded in getting across the message of continuing prevention of recurrent attacks of rheumatic fever when only 11 percent of these known cases are following any type of prophylactic regimen.

A recent report from Herrick House (18) emphasizes this discouraging state of affairs.

A 1955 annual followup of 100 children discharged after participating in a program of accelerated rehabilitation following an acute attack of rheumatic fever showed that 1 year later 29 of the 100 were receiving no medical care. Of the 71 under medical care, 38 were getting no prophylactic medication. Thus, 67 of the 100 were receiving no prophylaxis for rheumatic fever recurrences.

Making penicillin available to physicians for treating patients with a history of rheumatic fever is not always a solution. The physician committee of one heart association voted to provide oral or benzathine penicillin to physicians who had rheumatic children under their care. Approximately 90 such cases were reported as known to the practicing physicians in that community. One year later a review of the program revealed that only about six

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Violations of Interstate Quarantine Regulations

In the first conviction on violations of the interstate quarantine regulations, five hog feeders were recently found guilty by the United States District Court of Camden, N. J., of interstate transportation and feeding of uncooked garbage to hogs. The regulations under which they were convicted require that all garbage carried in interstate traffic and fed to swine must be cooked or heat treated to destroy agents of trichinosis.

The convicted hog feeders were placed on probation for 2 years under Public Health Service supervision, and warnings were issued that like violations will be prosecuted.

parents and children will be convinced of the importance of prevention.

The Case Register

An important device for developing an effective program is the case register. Case registers have been used successfully for many years in tuberculosis and other health programs requiring long-term followup. The case register provides a central mechanism which shows whether or not the rheumatic patient stays under medical supervision and receives prophylaxis regularly. Several cities have developed effective case registers and followup services. New York City, San Francisco, and Chicago are examples of such programs in larger cities. Pueblo, Colo., is an example of a program in a small city-county area. Fixing responsibility in one agency for the coordination of the program is important to the long-term success of the program.

Providing penicillin at a reasonable cost, or free when needed, is an important aspect of the prevention program. Patients enrolled on the register qualify for this penicillin, and it is made available on presentation of a prescription from the attending physician.

When the medical appointment is not kept or the prescription is not filled by a given date, followup begins. Clerks, public health nurses, or the medical social worker may be called on to look into the reason for lapses from care, depending on the nature of the problem involved.

Within a well-developed program of rheumatic fever prevention there will be a mechanism for adding new cases to the register as they are detected in school health programs or through other means. Private and public facilities for the evaluation of diagnoses are also needed, for it is as important to avoid imposing an unnecessary prophylactic regimen on a child with a functional murmur as it is to keep the child with true rheumatic fever on prophylaxis.

A label of heart disease not only may cause adverse psychological problems but may also create later difficulties in obtaining employment, or it may increase costs of personal insurance.

Availability to physicians of accurate and

convenient laboratory services for processing throat cultures of patients with suspected streptococcal disease is a fundamental part of an effective rheumatic fever prevention program. Streptococcal antibody tests such as the anti-streptolysin O titer should also be available through some central laboratory to help clarify the diagnosis when rheumatic fever is suspected (19).

The focus of attention on the problem of preventing rheumatic fever recurrences is in itself important, but the other problems that require attention should not be overlooked. The family, school, and vocational problems can be met more readily by community services if the framework of a rheumatic fever prevention program exists.

Summary

Although basic research into the etiology and pathogenesis of rheumatic fever is still urgently needed, one of the greatest practical problems in rheumatic fever prevention is a lack of effective application of available preventive measures.

Every State in the United States reported deaths from rheumatic fever and rheumatic heart disease in 1955. Progress in the control of rheumatic fever through the prevention or prompt treatment of streptococcal infections has resulted in the impression that this disease is now of minor importance. This is not true.

Current experience reveals that individual efforts of physicians or patients are not enough to maintain interest in and adherence to prescribed preventive measures. Approximately an 85-percent reduction in recurrences of rheumatic fever could be expected if current recommendations on prophylaxis of rheumatic fever were followed conscientiously.

Health departments, heart associations, and practicing physicians need to join forces in developing effective community rheumatic fever prevention programs that will assure the application of proved measures for the prevention of rheumatic fever.

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soft scar. The whole sequence could last 2 years, especially if complicated by purulent infection. Histologically most of the lesions were granulomatous, and acid-fast bacilli were demonstrated in only one case. However, the organism was isolated from both the water and the walls of the swimming pool associated with the epidemic, and laboratory studies on animals and human volunteers (the authors) proved conclusively that *M. balnei* was the etiologic agent. No new cases occurred after the pool was rebuilt, replacing the rough concrete walls with smooth tiles, and the chlorination system made more effective.

Zettergren, cited by Linell and Nordén (6), reported a similar episode of 60 cases in Västernorrland, Sweden. Although *Mycobacterium marinum* was considered the etiologic agent by Zettergren, Linell and Nordén isolated *M. balnei* from lesions and from the pool. The term "mycobacteriosis balnearea" was applied to the syndrome. When breakpoint chlorination was introduced, the epidemic was brought completely under control.

Other Reported Cases

Brück (7), in 1951, described 3 cases of inoculation tuberculosis, 2 of which were associated with swimming pool injuries. In 1952, he reported another case of inoculation lupus (8). Isolation of the tubercle bacillus from the lesions completely confirmed the clinical diagnosis. These findings led Brück to conclude that "so-called swimmer's lupus," or mycobacteriosis balnearea, could be separated into two types: (a) cases in which *M. tuberculosis* was the causative agent, and (b) cases in which *M. balnei* was responsible for the infection. He placed his 1952 case and those of Hellerström in the first category, and the cases of Linell and Nordén and Zettergren in the second. Hellerström, in a paper already cited (3), reviewed all of the available case histories and concluded with Brück that similar clinical manifestations may have been due to different etiologic agents. He suggested, however, that the organism isolated by Linell and Nordén might be a mutant of *M. tuberculosis*, or that it might be *M. marinum* as believed by Zettergren. He was unwilling to accept *M. balnei* as the responsible agent.

Tolmach and Frank (9), in the United States, reported another case of inoculation lupus vulgaris, which was characterized as skin granuloma with tubercle formation of unknown etiology. This infection resulted from a nose abrasion in a swimming-pool accident.

Nine cases of post-swimming-pool abrasion infections diagnosed as tuberculosis verrucosa cutis were observed by Rees and Bennett (10) in San Francisco. The clinical picture was quite different from that given by Hellerström. As to the etiology, Rees and Bennett ruled out granuloma due to silicates and deep fungus infections, but they were unable positively to define the agent. They mentioned the possibility of infection by the smegma bacillus or by *M. tuberculosis*, although neither was demonstrated in the lesions or the pool.

In the 1954-1955 Year Book of Dermatology and Syphilology (5b), Sulzberger and Baer reviewed the monograph by Linell and Nordén and commented as follows: "This is a masterly clarification of a relatively new entity apparently caused by a quite newly discovered acid-fast mycobacterium [*M. balnei*]. It appears virtually certain that this is the entity previously described by Hellerström in Sweden, D. E. H. Cleveland in Canada, Rees and Bennett and Jesse Tolmach and S. B. Frank . . . in the United States. It is small wonder that this infection of the bridge of the nose and other sites was in the past often considered a type of tuberculosis, and it is likely that the uninitiated will continue in this error in many future cases."

Conclusion

It is clear from the foregoing review that a new disease entity—a lupuslike dermatitis—and possibly a new means of transmitting skin tuberculosis are now known. What is not known is how widespread or frequent the infections are. The finding of cases in Europe, Canada, and the United States would indicate widespread geographic distribution. Those concerned with the operation of swimming pools should be aware of the potential hazard from this source, and the clinician should consider swimming-pool trauma in the diagnosis of tuberculosis-like skin infections.

From the limited data available, it would

Swimming Pool Injuries, Mycobacteria, and Tuberculosis-Like Disease

ARNOLD E. GREENBERG, S.M.,
and EDWARD KUPKA, M.D.

ABRASIVE accidents in swimming pools are not rare. They may occur in diving, in getting in or out of the pool, or in underwater swimming. Most frequently such accidents involve the bridge of the nose, the elbows, or the knees. Although in themselves they are seldom of consequence, it has recently been recognized that this type of accident may lead to inoculation lupus vulgaris, granulomatous tuberculosis lesions, or other tuberculosis-like lesions.

Mycobacterium tuberculosis

Hellerström (1), in 1951, reviewed six cases of inoculation lupus vulgaris, some of which he had reported as early as 1939 (2). They were all associated with swimming-pool injuries. Describing the clinical features, which were strikingly uniform, he wrote:

Within an area of a couple of square centimeters or more on the bridge of the nose an eruption developed, which consisted of soft papules, reddish-violet to reddish-brown in color, and ranging in size from a pinhead to a split pea; some of the papules were topped by crusts and coalesced. Two of the cases presented elevated ulcers measuring 15 by 15 and 7 by 7 millimeters, respectively. In the major proportion of cases the initial abrasion had healed when the papules appeared in the vicinity. On diascopic examination the papules showed the distinctive color of lupus nodules, and they were easily penetrated by a blunt probe applied with slight pressure. Hence, the clinical diagnosis was lupus vulgaris. The regional lymph nodes were either not at all, or only slightly to moderately, enlarged.

In one case Hellerström observed acid-fast bacilli in the lesions, thus affording some laboratory confirmation to his diagnosis.

Later Hellerström (3), using more sensitive laboratory techniques, was able to isolate the tubercle bacillus from one swimming pool. He

felt that the problem of skin tuberculosis acquired in swimming pools was complex and far from being solved. He suggested that, although tuberculosis control officers and sanitary engineers have an interest, "tuberculosis as a waterborne infection is a problem that calls for the attention of dermatologists . . ."

Also in 1951, Cleveland (4) reported four cases from Canada. He concluded that "the clinical and histopathologic appearance of the lesions was strongly suggestive of tuberculosis cutis" although "no acid-fast bacilli were demonstrated in the lesions . . ." All Cleveland's cases were associated with the same swimming pool, which was filled with tidal sea water and was under good sanitary control. He believed that the pool contamination might have resulted from the discharge of urine or sputum from an infected person. In summary, Cleveland suggested that "tuberculous infection may occur more often than the absence of reported cases would indicate."

In commenting on these papers, Sulzberger and Baer (5a) suggested that the etiology was questionable. They pointed out that the smegma bacillus may be present in pools in large numbers and also that this organism when inoculated into the skin produced a "tuberculoid type of response."

Mycobacterium balnei

In a comprehensive monograph, Linell and Nordén (6) summarized previous studies and described an epidemic of 80 cases of benign skin ulceration in Örebro, Sweden. They isolated a previously unknown *Mycobacterium* very similar to Koch's bacillus and gave it the specific name *balnei*.

Linell and Nordén's cases were characterized by a papular lesion of spongy consistency which was typically located on the outside of the elbow. The lesion grew slowly and eventually crusted, with scaling of the surrounding skin. Thick secretion developed under the crust and healing proceeded slowly, leaving a bluish-red

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Mid-Century Inventory

University Hospital's Diamond Jubilee

Health and peace, the hope of mankind, was the theme of the diamond jubilee convocation of University Hospital, a unit of New York University-Bellevue Medical Center, observed March 4 and 5, 1957. The 2-day program included discussions by Dr. Abraham Flexner, Dr. Howard Rusk, Hon. John E. Fogarty, Dr. Chester S. Keefer, Dr. Cassius J. Van Slyke, Dr. Herman E. Hilleboe, Dr. Edwin L. Crosby, and other distinguished guests. Selections from the program appear below. William E. Robinson was chairman of the convocation and Charles S. McVeigh, chairman of the steering committee. A message to the convocation from President Eisenhower was conveyed by Maj. Gen. Howard McC. Snyder.

The program was devoted to four general topics: chronic diseases, mortal enemies of man (cancer, viruses, bacteria), medical research at the crossroads, and major approaches to health.

Virus Diseases

brief Viruses cause no fewer than 50 different diseases in man and many more than that in plants and in animals. In human beings they lead to an enormous burden of illness, although in general, except in huge pandemics of the kind that occurred in 1918, most virus diseases do not directly cause death.

In this country they tend to produce between 4 and 6 episodes of illness per person per year. On the average, in the United States, man is afflicted by one or another virus disease about 10 percent of his life. Over a span of 70 years,

man suffers for 7 years with virus diseases. To put it another way, in this country, about 5 billion man-days are lost each year through virus diseases. No other category of disease approaches this total in terms of human disability.

The highest incidence results from those diseases we think least of and accept as inevitable ailments. These are the diseases of childhood, such as measles, chickenpox, and mumps, and the numerous respiratory infections, colds, influenza, and various forms of pneumonia, which occur throughout life.

The severity of these processes ranges from exceedingly mild, as in the afebrile common cold, through severe, as in paralytic poliomyelitis, to fatal, as in rabies.

The duration of virus diseases ranges from a few days or a week or two, as with the childhood and respiratory infections, to months,

Based on a paper by Dr. Frank L. Horsfall, Jr., vice president and physician in chief, Rockefeller Institute for Medical Research, New York City.

appear that swimming-pool construction and sanitation may play a significant role in controlling the spread of this disease entity. Smooth-surface walls and breakpoint chlorination have proved effective in curtailing epidemics.

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Air Pollution Training Courses

Six courses in air pollution will be conducted by the Air Pollution Training Section, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, during fiscal year 1958. They are designed for engineers, chemists, and other scientists in State and local health departments, control agencies, and university and industrial groups. Enrollment is by application.

The courses will be given according to the following schedule:

| | |
|----------------------|---|
| November 12-22, 1957 | Atmospheric sampling |
| January 13-24, 1958 | Atmospheric sampling analysis |
| February 17-21, 1958 | Detection and control of radio-active pollutants in air |
| March 10-12, 1958 | Air pollution effects on vegetation |
| April 7-11, 1958 | Source sampling and analysis |
| April 14-18, 1958 | Control of air pollution sources |

Applications and further information can be obtained by writing Paul F. Woolrich, chief, Air Pollution Training, Robert A. Taft Sanitary Engineering Center, Public Health Service, 4676 Columbia Parkway, Cincinnati, Ohio.

no impact on the life of man. But about 100 years ago, certain groups of bacteria began to be identified with serious human disease.

Today, what does man have to fear from bacteria and bacterial diseases? What may we hope to accomplish by the continued study of this great segment of microscopic life? We have mainly to fear complacency about the bacterial diseases and ignorance which so often masquerades as knowledge.

It is commonplace to hear that infectious diseases are no longer important, and in one sense this is true. But with the suppression of bacterial killers new problems emerge.

We are approaching that pristine state of the germ-free animals in the laboratories of Notre Dame, animals that rapidly succumb to such bacteria as the colon bacillus, which is normally present and harmless in every free-living animal.

Not only are germ-free animals entirely non-resistant to these normally harmless bacteria, but the capacity of their immune mechanisms to respond is greatly impaired.

It has been said by eminent sanitary engineers that, if the water supplies of our cities were disrupted, perhaps by war, for a period of several weeks, the population would be decimated by intestinal diseases.

It should be recalled that a large segment of the deaths following excessive exposure to radiation injury are due to bacterial invasion through the damaged lining of the intestines.

But let us turn to a peaceful, civilized society where most every want of man can be satisfied, where the bacterial diseases have been smothered under a blanket of antibiotics. What has happened that makes us uneasy, and increasingly aware of problems ahead? An understanding of these problems calls for scientific knowledge in bacterial ecology, bacterial genetics, and immunology.

I sketch here only the bare outlines. To take ecology first: every portion of the body that communicates with the outside environment has, from a few days after birth, a mixed bacterial population. The skin, the mouth, the nose and throat, the intestinal tract, each contains many kinds of bacteria—the normal flora of each particular area has been well known for many years.

Just why certain kinds of bacteria were present in large numbers and others in small numbers was not known, and, indeed, it is probable that no one gave the question much thought. Obviously, these bacteria had not only reached an accommodation with the human being who served as their host, but they had reached an accommodation with each other, much as rabbits and foxes on an island achieve a balance, which, although it may fluctuate a little, remains fairly stable until some extraneous influence enters the picture.

And so it was with the normal bacterial populations. Under the influence of antibiotic treatment, certain of these bacteria were greatly reduced in numbers, and then, to our surprise, other kinds of bacteria formerly present only in small numbers multiplied and produced diseases.

As for bacterial genetics, the staphylococcus, for example, is a ubiquitous species. Formerly, it was responsible for an occasional boil or for the infection of a wound or minor injury. It was discovered early that these bacteria in general are easily destroyed by penicillin.

But then it was found that a very small proportion of these organisms, in the order of 1 in 100,000,000, were resistant to penicillin owing to genetic factors. Before long, in more and more patients admitted to hospitals, all the staphylococci they harbored were resistant to penicillin and frequently to other antibiotics. Staphylococcus infections have now emerged as one of the most common and serious of the bacterial infections. Their treatment taxes to the utmost the ingenuity of the physician.

During the past 10 years, the penicillin-sensitive staphylococci have been killed off, leaving the penicillin-resistant strains to multiply and colonize. This same phenomenon might be taking place with certain other bacteria.

The entrance of bacteria or other infectious agents into the body starts a train of events which we refer to under the heading of immunity. A series of defense mechanisms is invoked, among which is the production of antibodies. These antibodies not only have some capacity of inhibiting or destroying the invading bacteria, but they also tend to persist, thus guarding the body against subsequent invasion by the same or closely related bacteria. This

sometimes many months, as in the case of infectious hepatitis or infectious mononucleosis.

Prevention and Treatment

Although there are some 50 virus diseases of man, it is possible now to provide effective prevention against only a handful, 5 or 6 at most, and it is possible to provide specific and effective treatment for none. Once started, virus diseases run their natural course unaffected by the best efforts of modern medicine.

The biology of virus infection offers an explanation for the difficulties that have been encountered in efforts to control them. Viruses are the smallest of all infectious agents, so small that they usually cannot be seen without an electron microscope. They multiply in a unique way and do so only inside living susceptible cells. When outside such cells, they have no metabolism of their own and so are inaccessible to the direct influence of antimetabolites and antimicrobial substances.

The most important basic principle that has been developed in the field of virus diseases is this: Without virus multiplication there is no virus disease. This places the mechanism of multiplication at the very heart of the problem. If we knew more of this mechanism perhaps means could be developed to control virus diseases.

The effective procedures for the prevention of a few virus diseases are almost all immunological in nature. Smallpox and yellow fever can be prevented effectively by modified but active virus vaccines.

Rabies, influenza, and poliomyelitis can be prevented by inactivated virus vaccines. In the future there may be vaccines available for measles, mumps, for certain of the respiratory infections, and possibly for some of the virus diseases that attack the brain.

Temporary protection can be secured against measles and hepatitis by the use of gamma globulin, derived from the blood of human beings, but most virus diseases, and most importantly, the commonest, cannot yet be effectively prevented.

Although there has been an intensive search for effective chemotherapeutic agents useful in the treatment of virus diseases for more than

20 years, modern antimicrobial substances, including antibiotics, have been of no avail.

Virus diseases remain the largest unsolved problem among infectious processes. They may have important implications bearing on other large problems in medicine, even on the problem of cancer.

The objective in treatment is to prevent multiplication of the virus without damaging the host. Some encouraging results have been secured in experimental laboratories recently. Among the striking advances have been those made by my associates at the Rockefeller Institute. New synthetic chemical compounds have been developed and some are highly active against various viruses in experimental animals.

They have been shown to inhibit the multiplication of influenza, mumps, and poliomyelitis viruses in the laboratory. The most potent are as active as the best antimicrobial compounds, but they act in a different way. They prevent the production of a substance called nucleic acid, an essential component of viruses, and do not markedly or permanently damage the host cell. In other laboratories, other approaches are being pursued with rewarding results.

It can be expected that the combined and continuing efforts of organic chemists, biochemists, and biologists, will solve these problems eventually. We begin to look forward without unfounded optimism to the time when common virus diseases will be preventable, treatable, and even curable.

Bacteria

brief Bacteria can play the role of man's best friend. Many of the chemical processes by which our soil is enriched, fermentative processes initiated, and wastes disposed of are dependent upon beneficent bacteria, and indeed, antibiotics themselves are bacterial products. In addition, there are a host of bacteria that seemingly have

Based on a paper by Dr. Thomas B. Turner, director of the department of microbiology, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md.

cells called "plasma cells." When these cells are deficient in number, the result is agammaglobulinemia, in which the patient is rapidly overwhelmed by bacterial infection unless treated by injections of gamma globulin extracted from normal human serum.

One curious and useful fact is that, once the body has been exposed to a particular antigen and has learned to manufacture a particular antibody, it retains a memory of the experience so that when it is exposed again to the same antigen, even years later, it is able to produce abundant amounts of the antibody with great speed.

This accelerated reaction to previously encountered antigens, sometimes known as the "booster" response, is an important mechanism in immunity. Indeed, it is likely that immunity to most bacterial infections is not so much due to the actual possession of antibody ready made or ready at hand in the blood when the bacteria make their appearance as it is to the host's capacity to recognize them, to remember what to do, and to make antibody in a hurry.

Factors involved in this faculty of remembering a particular antigen are not at all clear. The problem has recently engaged the attentive interest of the enzyme chemists, who have run into an analogous situation in their own field. Cells which produce particular enzymes in response to chemical stimulation also display a kind of memory of this act, and they will do so much more readily on a second occasion.

And now, one of the really elegant processes to be seen in science—the crossing and recrossing of two interdisciplinary lines by meditative investigators—is going on between the adjacent fields of immunology and enzymology.

Since the turn of the century we have seen the development of vaccines for the prevention of some of the nastiest diseases of mankind: diphtheria, tetanus, yellow fever, typhoid, typhus, rabies, encephalitis, and now poliomyelitis.

Antisera have been developed for the treatment of diphtheria, tetanus, and the bacterial pneumonias; serologic tests for the clinical diagnosis of a whole host of diseases, from the Wassermann test for syphilis to the measurement of antistreptococcus antibodies in

rheumatic fever and Bright's disease. Immunochemical research, which had its beginnings in Avery's delineation of bacterial polysaccharides by means of specific antibody, has led recently to the most delicate methods for separating and characterizing the proteins of the blood and learning what they are, where they come from, and what they do—this has the sound of a mature, highly developed science.

Does immunology have a future that can match its past? In my own view, we have seen only the beginning.

Among the problems which lie before us are, first, the great group of unsolved diseases of hypersensitivity, and, second, the transplantation of tissues.

Hypersensitivity

That disturbances of the immune mechanism may be the basis for human disease has been suspected for many years. We have substantial proof that abnormal antibodies are in part the cause of certain diseases. In some of the acute hemolytic anemias, massive destruction of red blood corpuscles occurs as a result of the production, by the patient himself, of antibodies which react with his own red cells. Similarly, in some cases of hemorrhagic disease, the blood platelets are acted upon by an antibody which destroys them and thus interferes with the coagulation of the blood.

The collagen diseases, or diseases of connective tissue, including rheumatic fever, rheumatoid arthritis, periarteritis nodosa, and disseminated lupus erythematosus resemble each other in important pathological respects. They are suspected of being based on the abnormal functioning of the body's immune mechanisms.

In rheumatic fever, for example, there is a strong likelihood that the hemolytic streptococcus infection, which always occurs about 2 weeks before onset, brings about a generalized allergic reaction in which the heart and joints are peculiarly involved.

This kind of allergy, in which bacteria or their products seem to furnish the responsible antigens, is one of the great mysteries in immunology. Its simplest form is in the tuberculin reaction, and it probably is important in the symptoms and lesions of tuberculosis itself

defense, however, is maintained at a price, for whenever these or closely related bacteria gain access to the body, a reaction between this antigen, as we call it, and the antibody takes place. Very often this interaction occurs on the surface or within certain cells of the body, and in this process the cells may be damaged.

The point is that antibiotics, products of bacteria, have the capacity to invoke these damaging reactions in the body cells. As the use of antibiotics broadens, the observed number of these reactions increases. My discussion already has suggested by implication certain fruitful lines of investigation. There are also areas in which research gives promise, because of the essential unity of biology, of contributing to areas which superficially at least might be regarded as remote from the problems of bacteria.

Because oft-repeated antigen-antibody reactions, perhaps quite minor in themselves, can lead to impressive degrees of damage, especially to connective tissue cells, there has been a good deal of informed speculation that the alarming increase in the so-called collagen diseases, such as lupus erythematosus, rheumatoid arthritis, and certain abnormalities of the medium-sized arteries of the human body, might be due in essence to this phenomenon. It may be that the common cold, measles, whooping cough, and as yet unaccountable virus infections are the genesis of many distressing ills of later life. If so, one approach to the prevention of the chronic diseases is clear.

The study of the bacterial cell has contributed much to our knowledge of cell physiology in general, and scientists are by no means at the end of this string. Many metabolic pathways have yet to be mapped out, and drugs and chemicals tested for their capacity to block certain essential metabolic functions.

There is always the possibility, too, that a mutant bacterial cell may partake of some of the unique properties of cancer cells and thus provide copious supplies of readily available test materials.

The study of bacterial physiology has made enormous contributions to our understanding of the role of vitamins in nutrition, to genetics, and to radiobiology, and such studies may well continue to yield important new knowledge in

these areas. Studies in dental health may take a cue from the fact that germ-free animals do not develop tooth decay regardless of the diet they are fed.

The effect of nonspecific factors that influence man's reaction to harmful bacteria is just beginning to be understood. Such factors as environmental temperatures, diet, and hormones seemingly have the capacity substantially to modify the host's reaction to bacterial infection, and there are indications that virus infections, and even malignancies, probably respond to some of these same basic biological laws.

Bacterial diseases do not clamor for attention. They no longer kill like wanton murderers. But dare we rest in the happy thought that man is now safe from this quarter at least?

Immunology



The fields in which specific and precise techniques of immunology have been successfully employed cover a broad area in biology. They range from such apparently crude matters as the mechanisms involved in the defense of the body against intrusion by foreign invaders to the pure techniques of immunochemistry, in which antibodies are used as a sort of chemical reagent for the quantitative measurement of substances which cannot even be detected, much less measured, by ordinary chemical means.

Indeed, in the capacity to measure things in exact quantitative terms, immunology is one of the few branches of biochemistry to approach the physical sciences.

Immunology is, in part, the study of antibodies produced by the cells of the host and released into the blood in response to stimulation by foreign agents. Much has been learned about this process and many practical applications of inestimable value to medicine have been made. It is known that antibodies are gamma globulins, proteins manufactured by specialized

Based on a paper by Dr. Lewis Thomas, professor and chairman of the department of pathology, New York University-Bellevue Medical Center, New York City.

most heartening to me. Roughly, it ties in with the definition of rehabilitation as we know it, which is simply this—a program to assist the disabled to live the best lives possible. His mission was to aid crippled medical schools to teach the best medicine possible.

It is fundamental in the entire concept of medical teaching to try to get the student to feel that there is just as much warm, inner satisfaction in taking a hemiplegic out of a wet bed and teaching him to walk and lead a life of some dignity and happiness outside an institution, and, as in one-third of the instances, to go back to some kind of gainful work.

There is just as much satisfaction in that accomplishment as there is in diagnosing a bizarre, rare disease that may be seen once in a medical lifetime, because, as it has been said by many authorities, that whether we like it or not 90 percent of the patients who seek services of the general physician have either problems of chronic disease or psychosomatic problems.

In modern life, physical wholeness is not necessary for a full life. Society for a long time has not paid for strength. It pays for what the individual has in his head and for the skill he has in his hands. Today we use only a fraction of our physical capacity in daily living or at work. But we carry this subconscious body image of physical perfection and ability as being synonymous.

In facing the problem of chronic disease and aging, probably the greatest preventive tool in our hands today is the use of stress. All of us live by stress. And if we order our lives to live under our stress reaction, our days are full, according to our own prescription and ability. We are stimulated physically, emotionally, and endocrinologically, and we set our whole lives subconsciously by this pattern. If we go too far beyond our stress end point, we are in trouble.

We also are in trouble if at a given period in life we say, or it is said to us, "Your work is finished. You go and sit and read and enjoy life." You cannot do this unless you have trained yourself to use stress in a new way, or in other words, you use the zest for life to set a new pattern for living.

If you are retired from your job, use the stress of community service, an avocation or

The Aging in the Community

It used to be that in psychiatry anyone over age 65 who had an illness was regarded as senile or arteriosclerotic. He was stored away, warehoused, simply taken care of.

It is found now that deterioration in age does not stem so much from a deterioration of vessels as it does from the fact that there is no longer a place in the community or in the home for the aging; so they retreat from reality, become depressed, and as the world passes them by, become confused.


We refuse to let this continue. Now we treat people up into their 80's and early 90's, with a fair return of these folks to the community.

—Dr. Francis J. Braceland, in a panel discussion at the diamond jubilee convocation of University Hospital.

other interests, for if you do not, your body will not have the stimulation physically, emotionally, and endocrinologically that it needs, and degeneration will promptly come.

This I believe to be the most important preventive course that we can take in finding the solution to the problem of aging until we learn the solution of arteriosclerosis, hypertension, and degenerative disease.

Human Resources

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Based on a paper by Maj. Gen. Howard McC. Snyder, physician to President Eisenhower, Washington, D. C.

as well as in other diseases, including typhoid fever, brucellosis, and perhaps even in pneumonia.

We know almost nothing about the mechanisms of bacterial hypersensitivity. Rather than being caused by a circulating antibody of the conventional sort, it is apparently mediated by the leucocytes, which behave as though they contain antibody.

The bacterial type of hypersensitivity may stem from an enormous blunder on the part of the body's defense mechanism. It has been shown experimentally that this type of hypersensitivity can lead to degenerative change in blood vessels and to the destruction, by the host, of large areas of his own tissues.

Transplantation Reactions

Another reason for investigating the process is the reaction of the body to transplanted tissues and organs. If a human being receives a graft of his own skin the grafted skin receives a new supply of blood vessels within 2 or 3 days and is well healed in about 7 or 8 days.

If the graft is a homograft, that is, taken from another human being, precisely the same events occur. But on the seventh or eighth day, small hemorrhages occur throughout the graft, the blood supply is cut off, and the tissue is completely destroyed within the next 2 or 3 days. By the 10th day, it is gone. If a new area of skin is taken from the same donor and grafted on the same recipient, the process of rejection is accelerated. The graft is rejected on the third or fourth day instead of on the seventh or eighth.

Rejection of a tissue homograft is a kind of hypersensitivity closely related to bacterial hypersensitivity. It is as though the host at first fails to recognize it as a foreign tissue and provides it with his own blood vessels and allows it to heal before the immune reaction sets in on the seventh day.

After having been grafted twice with the skin of another, the host will thereafter reject only that person's skin in an accelerated fashion; grafts from all others will not be rejected until the seventh or eighth day. This kind of immunity or hypersensitivity indicates

that the antigenic components in our tissues identify each of us as do our fingerprints. For surgery particularly this problem has extremely practical implications.

Not only skin but kidney, liver, lung, thyroid, adrenal, and other tissues can be transplanted, and all will survive until the host's immune mechanisms come into operation destroying the tissues. The only circumstances in which grafted organs will survive permanently are those involving identical twins, each possessing the same tissue antigens as the other, and avascular tissues, such as the cornea, which does not require a blood supply of its own.

A beam of sharp light has been thrown on the problem of reconstructive surgery by a group of British investigators. Led by Medawar and Billingham, they have succeeded in inducing complete tolerance to homografts in mice by exposing recipient mice during fetal development, or in the first day of life, to tissue cells from the projective donor animals. When these mice become adults, they can be grafted successfully with skin and other tissue homografts. Similar experiments have been successful in chickens, rats, and other laboratory animals.

Medawar's laboratory has produced a lively kind of zoo, with black mice bearing permanent grafts of white mice, and white chickens bearing grafts from which grow red feathers. Although this certainly does not immediately solve the problem of repairing or replacing damaged or destroyed human tissues, it should give us pause, and, I think, cause for hope in the future.

Chronic Diseases

brief I was delighted beyond expression to hear the great sage of medicine, Dr. Flexner, say that his mission in 1907 was to set up a program to rehabilitate the medical schools. To have him use that word in the concept that he did was

Based on a paper by Dr. Howard A. Rusk, professor and chairman of the department of physical medicine and rehabilitation, New York University-Bellevue Medical Center, New York City.

most heartening to me. Roughly, it ties in with the definition of rehabilitation as we know it, which is simply this—a program to assist the disabled to live the best lives possible. His mission was to aid crippled medical schools to teach the best medicine possible.

It is fundamental in the entire concept of medical teaching to try to get the student to feel that there is just as much warm, inner satisfaction in taking a hemiplegic out of a wet bed and teaching him to walk and lead a life of some dignity and happiness outside an institution, and, as in one-third of the instances, to go back to some kind of gainful work.

There is just as much satisfaction in that accomplishment as there is in diagnosing a bizarre, rare disease that may be seen once in a medical lifetime, because, as it has been said by many authorities, that whether we like it or not 90 percent of the patients who seek services of the general physician have either problems of chronic disease or psychosomatic problems.

In modern life, physical wholeness is not necessary for a full life. Society for a long time has not paid for strength. It pays for what the individual has in his head and for the skill he has in his hands. Today we use only a fraction of our physical capacity in daily living or at work. But we carry this subconscious body image of physical perfection and ability as being synonymous.

In facing the problem of chronic disease and aging, probably the greatest preventive tool in our hands today is the use of stress. All of us live by stress. And if we order our lives to live under our stress reaction, our days are full, according to our own prescription and ability. We are stimulated physically, emotionally, and endocrinologically, and we set our whole lives subconsciously by this pattern. If we go too far beyond our stress end point, we are in trouble.

We also are in trouble if at a given period in life we say, or it is said to us, "Your work is finished. You go and sit and read and enjoy life." You cannot do this unless you have trained yourself to use stress in a new way, or in other words, you use the zest for life to set a new pattern for living.

If you are retired from your job, use the stress of community service, an avocation or

The Aging in the Community

It used to be that in psychiatry anyone over age 65 who had an illness was regarded as senile or arteriosclerotic. He was stored away, warehoused, simply taken care of.

It is found now that deterioration in age does not stem so much from a deterioration of vessels as it does from the fact that there is no longer a place in the community or in the home for the aging; so they retreat from reality, become depressed, and as the world passes them by, become confused.

We refuse to let this continue. Now we treat people up into their 80's and early 90's, with a fair return of these folks to the community.

—Dr. Francis J. Braceland, in a panel discussion at the diamond jubilee convocation of University Hospital.

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exhausted body serves as a host for emotional disturbance. We found this to be the case with soldiers riddled with malaria as well as with soldiers who had been too long in the line, living in the mud and exposed to cold or the terrors of combat.

These same studies have sharpened our awareness of the dangers of a faulty personnel classification system, which assigns older men or men unaccustomed to physical strain to an infantry division for overseas duty. Unless men are given the opportunity to become hardened and unless recognition is taken of the fact that some men cannot be hardened, faulty assignment will lead to physical breakdown.

In our studies of occupational choice, we became acutely conscious of the stresses and strains, both physical and emotional, that confront most adolescents. Many young people are unable to cope effectively with the choices they face as regards their schooling and careers during these tumultuous years when they are being transformed from children into adults.

The book *What Makes An Executive* called attention to the fact that one of the distinguishing characteristics of leaders who reach the top by merit rather than by accident is the possession of a constitution which enables them to endure a grueling pace, to take punishment without breaking.

In connection with our efforts to deepen understanding of issues in the study of talent, we noted the heavy toll that deprivation can take during the early years of a child's life. Children with high potential at birth may show no sign of it by the time they enter school if they have been poorly fed, poorly housed, and otherwise poorly cared for. Deprivation and lack of stimulation at home can lead to lack of interest and apathy in school which sometimes even the best teachers cannot overcome. With the Nation ever more dependent on raising the level of skill and competence of the entire population, uninterested and lethargic pupils represent a major loss.

In our study of the Negro potential, we were impressed by the fact that in the period between World War II and the Korean War there were striking reductions in the incidence of venereal disease among young men both white and Negro with the most striking improvement found

among the latter. There seems to be little question that as the educational and income level of a deprived group rises, the health of its members will show significant gains.

In a major study on womanpower, the finding is that of the 28 million women who worked last year in paid employment, 60 percent were married. Three million had children under age 6, and 5 million had children between ages 6 and 17. I have been speculating whether many of these women may not be stretching themselves beyond their health limits in holding down a job in addition to discharging their family responsibilities.

This same study calls attention to the fact that approximately 1 out of every 2 women who works is 40 or older. I was struck by this finding, for during World War II the War Department prohibited sending women over 40 overseas on the ground that they might soon become unsettled on entering the menopause. The new opportunities that many women have to work out of the home and to earn money may help them feel that they have a continuing constructive role through that period.

Work and Mental Health

One of the initial questions for the conservation project was why a million young men were rejected for military service during World War II on the ground that they were suffering from an emotional defect, and why another three-quarters of a million who had been accepted had to be separated prior to demobilization.

As was suggested in our monograph, *Psychiatry and Military Manpower Policy*, a distinction must be made between diagnostic categories and performance criteria in evaluating men. The fact that a psychiatrist finds that a man has a tic, is sometimes anxious, or suffers from sleeplessness may lead him to label the man as suffering from one or another type of emotional disturbance. But from a social point of view the much more important consideration is whether such a man can meet the performance standards prevailing in his civilian or military environment, that is, whether he can hold down a job, support himself and his family, stay out of trouble with the law, and continue to perform effectively.

Among the most interesting findings emerging from our detailed case analyses of soldiers who broke down in World War II are materials contributing to an understanding of psychosis. We found on careful inspection that many soldiers who were finally separated because of a psychosis had been more or less seriously ill from the day they entered the Army, but in one way or another their illness had not interfered with their performance of their major duties. Many of these men had performed sufficiently well to have been promoted to corporal or sergeant and had been able to serve for 2 or 3 years before their aberrant behavior caused the Army to take definitive action regarding them. In civilian life also where the pressures are usually less extreme, many people manage to adjust even though they may be suffering from one or another type of psychotic disturbance.

Our studies have led us to consider not only the conditions surrounding the breakdown of men in the armed services but also those influencing the readjustment to civilian life. As a result we are convinced that a man's emotional state should never be assessed independently of the environment in which he must function. His behavior and efficiency will in large measure be determined by the support which he receives from the small group and the larger organization within which he works. Mental illness frequently can be prevented or precipitated by the quality of the leadership and the wisdom or lack thereof of organizational policy.

The studies of the Negro soldier to which I alluded earlier alerted us to the way in which segregation in the armed services during World War II proved to be a seedbed for frustration and emotional illness, particularly with educated Negroes from the North who developed intense hostility to what they considered a grossly unjust system. Although it will be years before the full benefit of desegregation in the armed services will be manifest, remarkable gains can already be noted.

In our studies of life histories of soldiers who failed in World War II, we have reconstructed as well as possible the life of the soldier before he entered the service, his experiences in the Army, and his readjustment as a veteran. It soon became clear to us that the concept of basic adjustment can never deal solely with a man's

strengths and weaknesses but must always include a simultaneous consideration of the demands and pressures in his immediate environment. A large number of men who had been able to make a tolerable adjustment in a civilian environment but who could not maintain the pace of an airborne division or even the discipline of military service were able, once they returned to civilian life, to reknit themselves and meet performance standards in their home communities.

Without further elaboration, the point can be made that mental health must never be approached as a static concept. There are great differences in environmental demands, and there are also great differences in the emotional resilience of people at different periods of their lives. We have been impressed with the strong drive that most people have to establish and maintain their emotional balance by getting and holding a job.

Work and Public Health

During World War II, 18 million men were screened for service. Almost 2 million, or 1 out of every 9 men aged 18 to 37, was found to be either a total illiterate, a borderline illiterate, or so poorly educated that he could not read instructions or write a letter. It is difficult indeed for such a person to take proper care of his own health or to know how to seek medical help when he requires it. The person who cannot read is cut off from much valuable information and advice about nutrition, health preserving measures, and effective therapeutic agents. As we found out in our studies of the uneducated, such people are also seriously handicapped in earning a decent livelihood, and it is exceedingly difficult to maintain effective health unless one can earn at least a modest income.

In many public discussions of compulsory military service, too little attention has been paid to the significant gains in health that are the indirect result of such service. The contribution of the Army in instructing soldiers in the prevention of venereal diseases during World War II was relayed to the home communities. Many soldiers had their first instruction in personal hygiene after entering the service.

In tracing the readjustment of soldiers who were separated prematurely from military service during World War II, we were impressed by the large number who rather quickly were able to rehabilitate themselves in civilian life. The availability of jobs of all kinds was a major aid especially because employers were willing in a tight labor market to be somewhat indulgent of the idiosyncrasies and disabilities of these veterans. Another helpful circumstance was the major support that many of these veterans received from their families, particularly from their wives.

Despite concern about the fact that so many mothers with young children at home hold down jobs, it was not possible for the National Manpower Council to do more than set this problem into perspective. However, I wonder whether we must not set off against the billions of dollars that these women earn the possible cost to the younger generation in being deprived of the loving care and supervision of their mothers.

With regard to the reasons why so many

young men, almost 2 million, were emotionally incapable of serving effectively in the armed services of their country during a major war, most of the generalizations about the emotional health of the American public based on these data are not valid, as is made clear in our forthcoming study *The Lost Divisions: Psychiatry and Manpower Logistics*. Our data tell us more about the state of psychiatric thinking and screening than they tell us about the emotional health of the American public.

Impact on Policy

A wide range of policy considerations is affected by our studies: the expansion of opportunities for basic education for young and older persons; improved educational and occupational guidance in and out of the school system; improvements in our military manpower planning; reconsideration of selection and promotion policies in business; the more effective utilization of the potential of minority groups; and the alterations required to insure the full

Homesteads

If your great-aunt, who is 75, had an ununited fracture of the hip and had no home to go to, where would be the best place for her? "The hospital," you would say, by reflex.

I am not so sure that this is true. She would be awakened every morning at half-past six and told to hurry up and get washed and have her breakfast, that there were "sick" people in the ward that needed attention.

When she was in the middle of her favorite program she would be shushed because there are "sick" people in the ward. She hasn't been sick; she simply has not been able to walk. She has lived in an atmosphere of pain and death and people getting well and going home while she has been left behind. Like this mythical great-aunt, more than 2,500 patients out of 10,000 patients covered in a survey of New York City's general hospitals did not need continuing hospital care.

So we have set up "homesteads" to meet the needs of this group. In the homesteads, which are beds in general hospitals that are not being used, patients will need only the medical care they would need at home.

Each homestead will have a parent hospital; doctors will have office hours every morning; there will be someone for emergency calls if these people get sick; there will be no nurses. Well-trained attendants and recreation workers will give these people the priceless ingredient they have not had, and that is a little fun in life, with a beauty parlor and a snack bar, and a little music at night, and a work shop, and all the things that give something to these people to enjoy. They will give these people clinically necessary food plus the fun for about one-fourth of what it costs to operate an acute general hospital bed.

—Dr. Howard A. Rusk, in a panel discussion during the diamond jubilee convocation of the University Hospital.

development of scarce talents and skills on which the future progress and security of our Nation depends. These are but a few of the points of contact between our research and policy.

The Medical Center

brief The term "medical center" is a relatively new one, perhaps born of the desire to claim size and preeminence as well as of the need to underline the concept of integration. The term has suffered some of the deterioration it perhaps deserved and "medical centers" have sprung up throughout the land, varying in size from a private association of a few physicians to great institutions such as the New York University-Bellevue Medical Center.

The medical center which we are discussing is defined as a large hospital with multiple clinical departments, research laboratories, and a program of medical education, usually in association with an undergraduate medical school. Such organizations existed long before the term "medical center" appeared.

The origins of medical centers are varied. Some began through the act of a legislature, some through a large private donation, and others by the often painful progress of reorganization and consolidation of existing institutions.

In considering the relationship of the medical center to the community it seems best to discuss first the beneficial aspect. Referring to no one center in particular, but to some ideal center distilled out of a partial knowledge of a number of such institutions, the medical center does provide a large share of the community's medical care. This may be measured by the number of surgical operations performed, of women delivered, of patient-bed days, or of out-patient department visits. Second, the center is the base for the early education of physicians. Finally, it is the site of most of today's medical research. Whether or not the medical center

is the best type of organization for the purpose, the community must now look to medical centers for the personnel as well as the ideas for the medicine of today and the immediate future.

These contributions are so widely recognized that one can safely turn to a consideration of stresses that arise from certain characteristics of the modern medical center. The size and prestige of the center expose it to the criticisms met by any organization which is the largest unit in a competitive field. The tensions thus built up develop principally between the professional member of the center and his brother physician outside. They have been most intense where a new medical school is being developed in a relatively small community, with the effect that the established practitioner finds his career threatened.

To those responsible for the center, public reporting appears natural and indeed an obligation, but to the outside physician it may appear as an indirect means by which patients are channeled into the hands of the physicians who hold a center appointment. In cities where State universities have set up medical schools, strong objections have been raised that the favored physicians of the centers were eventually profiting from the public funds which provided them with exceptional facilities.

Such tensions are at their worst in the early years of an institution's history. As a new generation of physicians appear, its plans are made with the existence of the center taken into consideration. The physician of the community learns to live with and indeed cooperate with the medical center.

A second source of tension arises from the fact that the center is intrinsically an institution of specialization. This specialization is made necessary by the obligation of the center to carry on clinical investigation, a process which itself requires the segregation of groups of cases of a similar nature.

The layman is annoyed by the multiplication of physicians he must see and compensate before diagnosis and therapy and nostalgically longs for that somewhat legendary figure, the family doctor, who could treat practically anything at any time of the day or night. Responding to what does appear to be a genuine need, the outside physician is trying, with a

Based on a paper by Dr. Howard C. Taylor, Jr., director of obstetrics and gynecology, Columbia Presbyterian Medical Center, New York City.

Today's Hospitals

Hospitals are the retailers that dispense the fruit of the laboratories. To illustrate the advances, 60 percent of all drugs prescribed in hospitals today were unknown 10 years ago. And only one-third of the space in a modern hospital is reserved for the patients; the rest is for all the modern technological equipment science needs on the firing line of therapy—scientific ammunition which requires an army of workers categorized by 200 different job descriptions.

—From the summary remarks of Dr. Howard A. Rusk at the diamond jubilee convocation of University Hospital.

considerable measure of success, to restore the prestige of general practice.

Here again, however, compromises have tended to soothe the conflict. Many physicians serve as specialists while functioning quite efficiently as general physicians. Furthermore, the center which is well adapted to its community has associated with it a large group of physicians, serving as part-time teachers, who are able to fill the role of the family physician and are capable also of conducting their patients through the intricacies of specialized diagnostic or therapeutic procedures.

Financial Aspects

Another characteristic of the center arises from the cost of its operation. Consideration of the sources of support will provide insight into the center's community relationships. The endowment fund of the private university or voluntary hospital, increased by unrestricted gifts from private sources, provides the basic support. The acquisition and amplification of such funds depend upon the devoted assistance and guidance of private individuals in the lay community.

The medical center must appear to be, and actually operate, as a continuation of the tradition of private American philanthropy for the care of the sick. This must somehow be managed in the face of current evidence that to the government is being delegated much of this burden. The center also must have such a

program that intellectual interest alone will supply an important inducement to community backing.

Of growing importance is the indirect support provided by cooperation with municipal and State governments. This principle has been rapidly expanded in recent years so that none of our great metropolitan teaching centers are without such an arrangement.

Although the costs of operation of these city and State institutions may not appear on the books, these hospitals are in a real sense an integral part of the center. The financial contribution, particularly of municipal government, is enormous. The center must then constantly consider its relationship to the political leaders of the community.

As the number of the indigent in our country has diminished, hospitals and medical centers have been faced by the unexpected possibility of becoming partly or completely self-supporting on the basis of a vast increase in the fees paid to the hospital or its staff for services. This basically happy development has brought new problems of community relationships.

The improved income may alienate a public which still regards the center as a charitable institution. Controversy over the distribution of new sources of income may make the center appear as a competitor, not only of the practicing physicians in general, but even of its own professional staff. The financial arrangements for radiology, for diagnostic laboratories, and for anesthesia are a special source of contention. Requirements of simplicity indicate that these might be regarded as a part of hospital services, while, on the other hand, a number of medical organizations have pronounced the principle that these are indeed true professional services and not proper sources of hospital income. Insurance for professional services offers no special problem for private or semi-private patients, but has produced an unsolved dilemma in the case of the ward patient, for whom, in most New York hospitals, tradition has decreed that the attending physician accept no fee.

The support offered by Federal and voluntary health agencies for medical research in university medical schools and hospitals of the

country has largely appeared since 1945. Such support can be obtained with such ease that the research facilities of our medical centers have been strained to their utmost. The organization which is needed to develop and transmit applications for such research support and to administer the ever-enlarging research programs has produced a new set of relationships between the center and other institutions.

A final characteristic of the medical center is found in its generally experimental nature as an organization. The center is extraordinarily sensitive to new developments and to opinions, in the community, of organized medi-

cine, institutions for the insurance of medical service, governmental agencies, or the general public.

For such reasons, the center is in the forefront of social and economic change in medicine. This characteristic adds to its basic importance and significance in the community. To the ultraconservative, the center may be the object of some suspicion and alarm; to the thoughtful and progressive, the center can be the source of inexhaustible interest as the place where productive controversy is most intense and where much that is new must be tested by trial.

Pan American Cooperation on Influenza

Members of the Advisory Committee on the World Health Organization Study Program for Influenza in the United States visited South America July 10 to 21, 1957, to stimulate special studies on epidemic influenza, and to set up channels for the interchange of information. The committee represents the Surgeons General of the Public Health Service, Army, Navy, Air Force, and the Office of the Secretary of Defense. At a meeting on August 13, which was devoted to a summary report of information obtained on the trip, the committee made the following recommendations:

In the event of epidemic influenza, the Public Health Service should be prepared to provide advisers and observers when requested by Brazil or other American countries through the Pan American Sanitary Bureau or the U. S. International Cooperation Administration.

A team of medical scientists should be available on the invitation of corresponding governments to undertake special studies of unusual problems in relation to epidemic influenza, in cooperation with local authorities in São Paulo, Buenos Aires, Montevideo, and Santiago.

Studies on epidemic influenza should be organized in the United States along lines similar to those being developed in South America. Appropriate organizations will require advance planning by a team of public health officers, physicians, and laboratory specialists in suitable communities or sections of communities. Studies at military bases should include dependents of military personnel to provide information on all ages and sexes.

Copies of appropriate material received from special studies sponsored by the Surgeons General of the Army, Navy, Air Force, and Public Health Service should be forwarded to the Pan American Sanitary Bureau for distribution to other countries through World Health Organization channels. Information is desired on age and sex specific attack rates and on the efficacy of vaccines, chemotherapy, and of chemoprophylaxis in complications.

HEALTH EDUCATION

in the Public Library

SIMON PODAIR and SAMUEL L. SIMON

THE PUBLIC LIBRARY, especially in urban areas, is rapidly becoming a center of community adult education. Health is a subject naturally adapted to a library adult education program. Its scope is universal; yet the problems it evokes can be brought home effectively to the participant in such a program. Although some libraries have full-blown, formalized adult education programs using the classroom approach, most offer activities of an informal nature: discussion groups, lectures, and forums. The well-publicized health program held in such a setting reaches a significant segment of the community; it attracts the unorganized members of the community, those who do not ordinarily attend meetings of formal groups, such as the PTA or the Rotary Club.

The Brooklyn Program

In 1956 a health education program was organized by the Brooklyn Office of the New York City Department of Health in cooperation with the Brooklyn Public Library. Sessions of the program were held monthly at local branch libraries from January through May. The library, with a central branch and 51 local branches throughout the borough, serves more than 2 million people. Independently administered, it is 1 of 3 library systems that cover the 5 boroughs of New York City.

Momentum for the program came from the Brooklyn office of the New York City Health Department, which approached the library's

Mr. Podair is borough consultant, health education, New York City Department of Health, and Mr. Simon serves as assistant coordinator of work with adults, Brooklyn Public Library.

coordinator of work with adults in the fall of 1955 on the feasibility of health education for the public in the branch libraries. The suggestion was well received.

At an introductory meeting of interested branch head librarians, the health department's borough health education consultant and the library's coordinator of work with adults outlined the program and requested reactions from the librarians. Stressed at this meeting was the importance of local level planning by both agencies. The health education consultant also described the organization of the health department as being subdivided into district health centers, pointing out that each librarian in the program would be working with the public health educator at the local health center.

Those branch librarians who had shown interest in the program and district health educators of the health department were invited to a planning meeting at which definite duties were assigned. The health education staff agreed to recruit qualified speakers, discussion leaders, films, and appropriate literature, to obtain the cooperation of community groups, and to work closely with the branch librarian in organizing the particular neighborhood for the program. The branch librarian, in turn, accepted responsibility for reaching branch members and community groups, for physical arrangements of each meeting, and for acting as chairman of the program in his branch. The central branch of the library was responsible for overall publicity and the coordination of all branch programs. Publicity included a flyer, *Highways To Health*, distributed through the branches and the community, newspaper releases, radio spot announcements, and items in the monthly publication of the library, the *Brooklyn Public Library News Bulletin*. The borough health education consultant of the health department worked closely with the district health educators, assisting them with such problems as procuring speakers and techniques of organization.

Each district health educator met with his branch librarian to discuss the topics to be covered, based on the particular health needs of the district. The planning committees, including representatives of churches and PTA's, se-

lected topics for discussion in each area. Subjects included heart disease, cancer, nutrition, drug addiction, juvenile delinquency, emotional health of children, childhood diseases, alcoholism, adolescent problems, diabetes, poliomyelitis, and home safety.

Program speakers and discussion leaders were drawn from local and citywide sources. These included the local medical society, staff members of the health department, and voluntary agencies, such as the New York Heart Association and the Brooklyn Cancer Committee. Sixteen-millimeter films were obtained from the bureau of public health education of the New York City Department of Health. Staff nurses of the Visiting Nurse Association of Brooklyn distributed the flyers on their regular home visits.

For some programs, the library prepared book lists related to the topics under discussion. In addition, the branch librarian made book displays and spoke briefly on books pertinent to the program.

Community interest often went beyond district boundaries. The borough office of the New York City Department of Health, for example, received calls requesting information on the dates and places scheduled for discussion of specific topics. A voluntary agency cooperating in the program reported a request for information on specific local activities. To some meetings, daily newspapers sent reporters to cover the program, and in one instance, the news story that resulted was featured on the front page of the Brooklyn section of a leading metropolitan paper.

Fifty-five monthly programs were held in 13 branches, with a total attendance of 1,444. Approximately 1,000 more persons attended special programs for Spanish-speaking residents. These programs, held in areas with a high Spanish-speaking population, had the participation and support of the leaders of the Spanish-speaking community.

Agency Cooperation

As our program progressed, the advantages of cooperative planning between agencies became apparent. The complexity of organizing

55 health education programs during a 5-month period was reduced by using the staff skills and facilities of both agencies, that is, health education materials and resources of the health department and the effective publicity program of the library.

Another advantage came from workers in different fields attempting to meet the same problems. It became obvious that each group could gain valuable experiences through the approaches and insights of the other. This process of learning from each other was greatly enhanced by cooperative planning.

Also, the division of responsibility brought about economy since each agency did not have to assume full responsibility for staff time or financing.

Such planning placed an example before the community as a whole. The public could observe that planning between two large municipal agencies resulted in community service. Other agencies also became aware of the growth inherent in reaching out from the narrow confines of their own fields into joint programming with agencies in different but related fields.

A short audience evaluation questionnaire was distributed after each program to gauge audience reaction. Eighty-five percent of the evaluation forms distributed were returned to the branch librarians. Ninety-eight percent indicated that the programs were worthwhile and that the people attending would be willing to attend more of them. Many commented that the meetings were not held frequently enough. Critical comments included "did not enter the subject deeply enough," "would like to have seen a more recent film," or "noise of projector a little disturbing."

Sixty percent stated that they held library cards, indicating a fairly large attendance from segments of the community that ordinarily do not use library facilities, and pointing up the potentialities of the local library as an adult education center.

There was lack of continuity of attendance: Each meeting in the series at a particular branch attracted, in the main, different persons. A small core of individuals attended most of the series in their neighborhood branches. The largest attendance occurred at programs that

highlighted pressing community problems, such as mental health and juvenile delinquency. This emphasizes the importance of a study of community needs and backgrounds even before planning gets under way.

Audience participation in discussion at each program also can be considered a yardstick of evaluation. Such discussion for the most part covered a considerable section of the audience.

A firm base of voluntary cooperation has been established in health education program-

ing between two large municipal agencies, a base that resulted from a fusion of concepts and techniques of a public health and an adult education agency. Through this program the public health workers who participated have tried to underscore the link between community health education and adult education.

Our prime conclusion is that the public library systems of our country offer an insufficiently explored but significant avenue of community health education.

publications

The Engineer in the U. S. Public Health Service

PHS Publication No. 455. Revised December 1956. 16 pages; illustrated.

This revised pamphlet, directed to college engineering students, stresses the opportunities and benefits of a career in the Public Health Service commissioned corps.

It describes in detail operations of the various programs and brings up to date the sections on research and development at the Robert A. Taft Sanitary Engineering Center, the Communicable Disease Center, the Arctic Health Research Center, the National Institutes of Health, the Occupational Health Program, and the work of sanitary engineers in civil defense and foreign service.

Health Manpower Chart Book

PHS Publication No. 511. 1957. By George St.J. Perrott and Maryland Y. Pennell. 59 pages; tables and charts. 25 cents.

Nearly 2 million persons are employed in occupations usually considered in the health field. This report presents in numerical and

graphic terms information on certain characteristics of the health professions, with special emphasis on medicine, dentistry, and nursing. Personnel employed in health service industries and health occupations are shown, along with their age, sex, income, and length of work year.

For physicians, dentists, and nurses the numbers of practitioners and graduates are illustrated for selected years. The current number in each profession and the changes that have occurred within the last 30 years are given for States and regions. Urban-rural differences in supply and types of practice are discussed, along with gains and losses to the profession.

Tools for Evaluation of Cancer Nursing

For nursing instructors

PHS Publication No. 538. 1957. 21 pages. 25 cents.

Three tests for evaluating nurse behavior and knowledge in the field of cancer nursing are introduced in this monograph. They were developed in the last 5 years under the direction of Rosalie I. Peterson, chief, Nursing Section, Field In-

vestigations and Demonstrations Branch, National Cancer Institute, and Dr. Lonis Heil, director, office of testing and educational research, Brooklyn College.

The tests deal with cancer knowledge, nurse-patient relationships, and problem solving, respectively. The monograph also discusses the philosophy underlying the construction of the tests, reports the history of their development, briefly reviews the findings obtained in student and faculty testing programs, and comments on the validity and reliability findings.

The script of one "episode" from the nurse-patient relations test and six sample questions to familiarize the reader with the methodology employed in testing are contained in the appendix.

The complete data are published elsewhere.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Diarrheal Disease Control by Improved Human Excreta Disposal

L. J. McCABE and T. W. HAINES

THE EFFECT of fly control on the reduction of diarrheal disease has been demonstrated twice (1, 2). In south Georgia, Lindsay, Stewart, and Watt (2) observed that the prevalence of *Shigella* infections was reduced during fly control activities. As long as flies were easy to control with DDT and other insecticides, an effective diarrheal disease control procedure was available, but the development of insecticide-resistant flies necessitated a closer examination of the fly's role in the transmission of diarrheal disease in the hope of finding another control procedure.

The exclusion of flies from their source of human enteric pathogens should prevent fly transmission of shigellosis. An experiment was therefore designed to measure the effect of excluding flies from contact with human excrement in an area where they had previously had ready access to such excrement. Flush toilets, water-carried sewage, and sewage treatment would have been the most effective method, but for the purposes of this study a cheap and easily ef-

fected alternative was necessary. An adaptation of the bored-hole latrine was used. This consisted of a hole 8 feet deep and 16 inches in diameter, covered with a concrete slab 4 feet square, with an aluminum riser, seat, and lid. The old privy structure was moved over the slab; if there had been no privy, the householder built a simple structure. (Details of design and construction are given on pp. 926-927.)

This privy rehabilitation program was conducted in Boston, Ga. (1950 population, 1,035). Boston had been included in an early fly control study (2). Until fly resistance made their use ineffective, DDT, dieldrin, and chlordane had been used there as residual sprays and DDT, as a space spray.

Plan of Study

All premises in the study town were inspected in January 1952 and notes were made of the excreta disposal methods used and their relative effectiveness. About half of the community was served by a sewerage system with treatment, which made the correction of disposal methods easier. Fifty-two percent of the 344 occupied dwellings had unsatisfactory facilities for excreta disposal, mostly surface privies. During April and May the excreta disposal facilities at 178 dwellings were improved by constructing a new privy or rehabilitating the old privy with an 8-foot-deep bored hole. At three dwellings it was necessary to renovate privies that were used by servants, and an additional 19 privies were remodeled at schools, churches, and commercial buildings.

Mr. McCabe, a sanitary engineer, is with the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Mr. Haines, formerly with the Public Health Service, is with the Entomology Branch, Biological Warfare Laboratories, Fort Detrick, Frederick, Md. During the time of this study Mr. McCabe was assigned to the Epidemiology Unit, and Mr. Haines, to the Entomology Unit, PHS Communicable Disease Center Field Station, Thomasville, Ga.

This paper is the fifth in a series on control of diarrheal diseases.

Upon completion of the construction phase of the program, at no cost to the residents, all available excreta disposal facilities in Boston were satisfactory. Information leaflets were distributed through the schools and were left at each house where work had been done. These leaflets explained the program and requested cooperation in the correct use of the privies. A notice was also stenciled on the seat lid to the effect that flies carry sickness and should be kept out of privies. Almost everyone used the privies because the units were a marked improvement, esthetically and otherwise, over previous facilities.

The method of making epidemiological observations of morbidity and *Shigella* prevalence before and after the privy rehabilitation program were the same as that used in a previous study (2). Blocks with a high proportion of children were selected for study. The families in the study blocks were visited monthly by trained lay enumerators, and histories of diarrheal disease were obtained for all family members. The average study population was 333, or about one-third of the community. Rectal swab cultures for the isolation of *Shigella* organisms were collected monthly from children under 10 years of age.

The evaluation of fly populations was a continuation of the entomological observations reported previously (2). A visual count method based on the Scudder grill was used. Representative blocks, consisting of about 15 percent of the total blocks, were sampled weekly and the five highest grill counts observed in each block were recorded. Observations were curtailed during the coldest weather when fly activity was minimal.

To obtain a measure of the contact of flies with human excreta, samples of privy contents were collected every 2 weeks from 10 percent of the privies in the community. The privies were selected at random, and each sample consisted of two quarter-pint portions. One portion was treated by brine flotation and the larvae were removed and identified. The other portion was held in an insectary and the insects that emerged were identified. At the time of sampling, observations were made of the condition of the privy, including a count of adult flies in the pit and in the privy structure. Dur-

ing the late months of the study, this schedule was reduced to sampling 5 percent of the privies in the community every third week.

For the purpose of comparison, similar epidemiological and entomological observations were made in three other towns—Pavo, population 806; Coolidge, population 764; and Meigs, population 1,125—where nothing had been done to the privies. The study populations in these towns were similar to the study population in Boston as to race and age distribution and environment.

Results

Remodeling the privies made a considerable change in the proportional distribution of flies breeding in them. The bored hole was very dark, and in half of the privies there was ground water in the hole. The relative frequency of fly breeding in unmodified privies and in the bored-hole privies is shown in table 1. *Hermetia illucens* and members of the Phoridae, Drosophilidae, and Culicidae were observed to be breeding more frequently as a re-

Table 1. Percentage of privies breeding insects in areas with unmodified privies and in an area with bored-hole privies, south Georgia, April 1952–March 1953

| Unmodified privies ¹ | | Bored-hole privies ² | |
|---------------------------------------|-----------------|---------------------------------------|-----------------|
| Insect | Percent privies | Insect | Percent privies |
| <i>Hermetia illucens</i> ³ | 51.2 | <i>Hermetia illucens</i> ³ | 59.6 |
| <i>Ophyra</i> spp.----- | 23.0 | Phoridae----- | 11.2 |
| <i>Sarcophaga</i> spp.----- | 14.8 | Drosophilidae----- | 6.4 |
| <i>Fannia</i> spp.----- | 10.8 | <i>Ophyra</i> spp.----- | 6.1 |
| <i>Musca domestica</i> ----- | 8.7 | <i>Psychoda</i> spp.----- | 5.6 |
| <i>Psychoda</i> spp.----- | 8.3 | <i>Sarcophaga</i> spp.----- | 4.8 |
| <i>Muscina</i> spp.----- | 5.1 | Borboridae----- | 2.9 |
| <i>Hydrotaea houghii</i> ----- | 4.8 | Culicidae----- | 2.9 |
| <i>Dendrophaonia</i> spp.----- | 3.2 | <i>Musca domestica</i> ----- | 1.6 |
| Borboridae----- | 3.1 | <i>Muscina</i> spp.----- | 1.6 |
| Phoridae----- | 1.7 | Scatopsidae----- | 1.6 |
| Syrphidae----- | 1.6 | <i>Milichello lacteipennis</i> ----- | 1.6 |
| Drosophilidae----- | 1.6 | Phyllomyzidae----- | 1.3 |
| Culicidae----- | 1.6 | <i>Fannia</i> spp.----- | 1.1 |
| Sepsidae----- | 1.2 | <i>Hydrotaea houghii</i> ----- | 1.1 |
| Scatopsidae----- | 1.0 | All others----- | (4) |
| All others----- | (4) | | |

¹ Check towns, 939 samples.

² Boston, Ga., 377 samples.

³ Stratiomyidae.

⁴ Less than 1 percent each.

sult of the privy reconstruction, but the majority of the muscoid group showed a marked decrease. The amount of housefly (*Musca domestica*) breeding in privies had been similar in all the towns, but after privy remodeling there was a reduction in the percentage of privies breeding houseflies in Boston, and this rate of breeding is significantly lower than the rate of housefly breeding in the check towns (tables 2 and 3). On only eight occasions were the privies in Boston found to be breeding sites for houseflies after the program began, and the rate was low, 3.5 (larvae and reared adults) per half-pint sample of privy contents compared

with 50.3 in samples taken from privies in the check towns.

The bored-hole privy was less attractive to houseflies than the unmodified privies. Adult flies were observed in the pit or privy structure only 4 percent of the 377 times samples were taken, with a median count of 2.5 flies for these times. In the check towns, the conditions were different—in the 939 samplings, houseflies were observed 31 percent of the time with a median count of 10.

The reduction of housefly breeding observed in rehabilitated privies had no appreciable effect on community fly populations. Since

Table 2. Unmodified privies—entomological and epidemiological observations, by climatic periods, south Georgia, April 1951–April 1952

| Observations | Boston | Check towns | | | |
|--|--|------------------|--------|----------|--------|
| | | Total | Pavo | Coolidge | Meigs |
| | Warm weather (April–October 1951) ¹ | | | | |
| Privies breeding <i>Musca domestica</i> | (²) | (²) | ----- | ----- | ----- |
| Grill count <i>M. domestica</i> ³ | 30 | 28 | 36 | 21 | ----- |
| <i>Shigella</i> cultures ⁴ | 382 | 915 | 355 | 281 | 279 |
| Positive: | | | | | |
| Number..... | 23 | 26 | 14 | 6 | 6 |
| Percent..... | 6.0 | 2.8 | 3.9 | 2.1 | 2.2 |
| Diarrhea symptoms: ⁵ | | | | | |
| Person-months of experience..... | 1, 215 | 3, 352 | 1, 012 | 829 | 1, 511 |
| Number cases..... | 21 | 68 | 28 | 10 | 30 |
| Rate per 1,000..... | 17.3 | 20.3 | 27.7 | 12.1 | 19.9 |
| Cool weather (November 1951–April 1952) ⁶ | | | | | |
| Privies breeding <i>M. domestica</i> : ⁷ | | | | | |
| Number sampled..... | 164 | 196 | 126 | 45 | 25 |
| <i>M. domestica</i> : | | | | | |
| Number..... | 23 | 31 | 27 | 4 | 0 |
| Percent..... | 14 | 16 | 21 | 9 | 0 |
| Grill count <i>M. domestica</i> ³ | 11 | 15 | 13 | 21 | 12 |
| <i>Shigella</i> cultures ⁴ | 303 | 774 | 255 | 226 | 293 |
| Positive: | | | | | |
| Number..... | 9 | 30 | 15 | 13 | 2 |
| Percent..... | 3.0 | 3.9 | 5.9 | 5.8 | 0.7 |
| Diarrhea symptoms: ⁵ | | | | | |
| Person-months of experience..... | * 1, 246 | * 3, 212 | 994 | 614 | 1, 604 |
| Number cases..... | 18 | 49 | 11 | 15 | 23 |
| Rate per 1,000..... | 14.4 | 15.3 | 11.1 | 24.1 | 14.3 |

¹ Mean monthly temperature 65° F. or more.

² Comparative data not available.

³ Average third high grill count. Index of *M. domestica*, average of recorded monthly averages. In some months, particularly in cool weather, no counts were made. However, these omissions occurred in all towns and the counts are relative.

⁴ Obtained by culturing rectal swabs of children less than 10 years old.

⁵ Attack rates per 1,000 person-months of experience for total population in study area.

⁶ Mean monthly temperature less than 65° F.

⁷ Larvae identified and adults reared from a half-pint sample of privy contents.

⁸ January–April 1952.

Table 3. Remodeled privies—entomological and epidemiological observations, by climatic periods, south Georgia, May 1952–October 1953

| Observations | Boston ¹ | Cheek towns, unmodified privies | | | |
|--|--|---------------------------------|-------|----------|-------|
| | | Total | Pavo | Coolidge | Meigs |
| | Warm weather (May–September 1952) ² | | | | |
| Privies breeding <i>Musca domestica</i> ³ | | | | | |
| Number sampled ----- | 186 | 459 | 121 | 177 | 161 |
| <i>M. domestica</i> | | | | | |
| Number ----- | 4 | 51 | 20 | 18 | 13 |
| Percent ----- | 2 | 11 | 17 | 10 | 8 |
| Grill count <i>M. domestica</i> ⁴ | 32 | 52 | 28 | 83 | 44 |
| <i>Shigella</i> cultures ⁵ ----- | 295 | 843 | 242 | 232 | 369 |
| Positive | | | | | |
| Number ----- | 10 | 46 | 21 | 20 | 5 |
| Percent ----- | 3 4 | 5 5 | 8 7 | 8 6 | 1 4 |
| Diarrhea symptoms ⁶ | | | | | |
| Person-months of experience | 1,568 | 3,816 | 1,222 | 768 | 1,826 |
| Number cases ----- | 16 | 78 | 26 | 27 | 25 |
| Rate per 1,000 ----- | 10 2 | 20 4 | 21 3 | 35 2 | 13 7 |
| Cool weather (October 1952–April 1953) ⁷ | | | | | |
| Privies breeding <i>M. domestica</i> ³ | | | | | |
| Number sampled ----- | 221 | 329 | 104 | 107 | 118 |
| <i>M. domestica</i> | | | | | |
| Number ----- | 3 | 15 | 10 | 5 | 0 |
| Percent ----- | 1 | 5 | 10 | 5 | 0 |
| Grill count <i>M. domestica</i> ⁴ | 8 | 10 | 9 | 15 | 7 |
| <i>Shigella</i> cultures ⁵ ----- | 316 | 1,054 | 346 | 216 | 492 |
| Positive | | | | | |
| Number ----- | 2 | 32 | 13 | 0 | 19 |
| Percent ----- | 0 6 | 3 0 | 3 8 | 0 0 | 3 9 |
| Diarrhea symptoms ⁶ | | | | | |
| Person-months of experience | 1,752 | 5,592 | 1,547 | 1,026 | 3,019 |
| Number cases ----- | 10 | 59 | 13 | 17 | 29 |
| Rate per 1,000 ----- | 5 7 | 10 6 | 8 4 | 16 6 | 9 6 |
| Warm weather (May–October 1953) ² | | | | | |
| Privies breeding <i>M. domestica</i> ³ | | | | | |
| Number sampled ----- | 74 | 43 | 43 | --- | --- |
| <i>M. domestica</i> | | | | | |
| Number --- | 1 | 4 | 4 | - | - |
| Percent --- | 1 | 9 | 9 | - | - |
| Grill count <i>M. domestica</i> ⁴ | 40 | 53 | 64 | 61 | 33 |
| <i>Shigella</i> cultures ⁵ ----- | 293 | 872 | 285 | 200 | 387 |
| Positive | | | | | |
| Number --- | 13 | 80 | 36 | 10 | 34 |
| Percent --- | 4 4 | 9 2 | 12 6 | 5 0 | 8 8 |
| Diarrhea symptoms ⁶ | | | | | |
| Person-months of experience | 1,809 | 4,976 | 1,179 | 921 | 2,576 |
| Number cases ----- | 19 | 102 | 41 | 12 | 49 |
| Rate per 1,000 --- | 10 5 | 20 5 | 27 7 | 13 0 | 19 0 |

¹ All privies in Boston remodeled in April and May 1952

² Mean monthly temperature 65° F or more

³ Larvae identified and adults reared from a half-pint sample of privy contents

⁴ Average third high grill count. Index of *M. domestica*, average of recorded monthly averages. In some months, particularly in cool weather, no counts

were made. However, these omissions occurred in all towns and the counts are relative

⁵ Obtained by culturing rectal swabs of children less than 10 years old

⁶ Attack rates per 1,000 person-months of experience for total population in study area

⁷ Mean monthly temperature less than 65° F

Table 4. *Shigella* prevalence rates in areas with unmodified privies and with remodeled privies, south Georgia, April 1951–October 1953

| Type of privy and area | Before privy remodeling (April 1951–April 1952) | | | After privy remodeling (May 1952–October 1953) | | | “p” (X ² test) ¹ |
|-----------------------------------|--|---------------------|---------|---|---------------------|---------|--|
| | Number rectal swab cultures | Shigella isolations | | Number rectal swab cultures | Shigella isolations | | |
| | | Number | Percent | | Number | Percent | |
| Bored-hole privies (Boston) ----- | 685 | 32 | 4.7 | 904 | 25 | 2.8 | ----- |
| Unmodified privies ----- | 1,689 | 56 | 3.3 | 2,769 | 158 | 5.7 | <.001 |
| Pavo ----- | 610 | 29 | 4.8 | 873 | 70 | 8.0 | <.001 |
| Coolidge ----- | 507 | 19 | 3.7 | 648 | 30 | 4.6 | .05 |
| Meigs ----- | 572 | 8 | 1.4 | 1,248 | 58 | 4.6 | .025 |

¹ Probability that, in the postremodeling period, observed or greater difference in *Shigella* prevalence between the area with remodeled privies and the check towns would have occurred by chance. Probability

that difference in *Shigella* prevalence rates between 1 year before to 1 year after privy remodeling periods in Boston, Ga., occurred by chance is 0.008–4.7 percent vs. 2.0 percent.

houseflies have been found to breed in a greater variety of media than have other common muscoid flies, it was to be expected that the reduction of breeding in one medium would have little effect (3). The average fly counts, by climatic periods, are shown in tables 2 and 3. Lindsay, Stewart, and Watt (2) observed that the increase in *Shigella* transmission came after they lost control of houseflies when the other fly species were still controlled. Consideration has been given to the housefly because small numbers of other fly species were observed in these communities; during the study period, the average monthly count for all other species was 1.3 flies.

During the 18 months of observations after the privy remodeling program was completed, Boston had a significantly lower rate of *Shigella* infections than it had before the program, 2.8 percent vs. 4.7 percent (table 4). In this comparison, two-thirds of the postprogram data taken were obtained during warm weather, whereas only 7 of the 13 months in the pre-program period were the warm months commonly associated with higher rates of *Shigella* infection. The infection rate in Boston was higher than in the check towns for the 13 months before the program (4.7 vs. 3.3 percent), but after the privies were remodeled the Boston rate was lower (2.8 vs. 5.7 percent), as shown in table 4.

The number of persons reporting diarrhea as a symptom of illness is shown in tables 2 and

3. After the excreta disposal methods were improved, the reported diarrhea rate in Boston was only half as high as in the check towns.

Discussion

The bored-hole privy of the design used in this study did not exclude all houseflies from human excreta, but its low attractiveness to houseflies did mitigate this problem somewhat. Deficiencies noted in the design were that the size of the riser permitted fouling of the inside rear of the riser and that, in some of the privies, portions of the contents were floating on the high ground water.

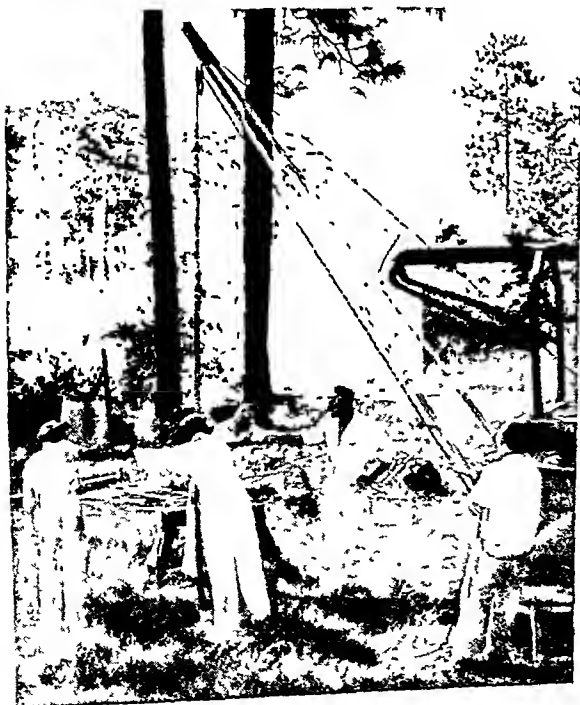
The reduced housefly breeding observed in the bored-hole privies in Boston, where the fly had become highly resistant to the hydrocarbon insecticides, is more remarkable in light of recent ecological studies. In unpublished data, Lindsay states that during studies conducted in Hidalgo County, Tex., in 1946, “not a single housefly was reared from material from anything resembling a pit privy although surface samples frequently were producers.” More recently, results from housefly breeding surveys following treatment with hydrocarbon insecticides in the same general areas as well as in other areas, have shown decided increases in housefly production from privy pits (4–6).

Results of this study show the approximate maximum level in the reduction of *Shigella* transmission that can be obtained and maintained by the use of good privies alone. With

a water-carried excreta disposal system, the exclusion of flies from human excreta would be more effective than with privies. Also, when water-carried excreta disposal methods are installed, hand-washing facilities usually are also made more available, and the availability of water has been shown to have an influence on rates of *Shigella* infections (7, 8). It would be difficult to assess the effect of a water-carried excreta disposal system only, except in an expensive controlled study.

The various recognized mechanisms of transmission of *Shigella* need evaluation in order to develop the best diarrheal disease control program. It is now possible to compare the relative effectiveness of two control procedures: fly exclusion using bored-hole privies, as reported here, as opposed to reduction of fly population with chemicals, as performed in Texas (1) and Georgia (2). The Georgia studies virtually eliminated flies from the environment, thereby providing an estimate of the effect of complete

design and construction OF BORED-HOLE PRIVIES



Some of the techniques of privy design and construction presented here may be helpful in rural sanitation programs since the privy will continue to be an important means of excreta disposal in the United States for some time, and in many sections of the world it may be the principal method used. The 1950 census of housing reports that 8,900,641 rural dwellings in this country did not have flush toilets inside the structure, and over 2 million urban dwellings did not have flush toilets.

The bored-hole privy used in this study is an adaptation of the bored-hole latrine 18 to 20 feet deep used by the Rockefeller Foundation in the Philippines. The same type of Iwan 16-inch latrine borer was used. An A-frame was constructed on the rear of a pickup truck to hoist the auger out of the hole as the bucket filled (fig. 1). The shaft on the auger was 12 feet long with a crossarm that could be raised as the digging progressed. A crew of 5 men, a carpenter and 4 laborers, bored the hole and set a precast concrete slab over it. Minimal repairs were made to the old privy structure, which was moved to the new location (fig. 2). The privy contents at the old location were buried.

The concrete slabs for the remodeled privies were made 4 feet square and reinforced so that they could be used later on standard pit privies. The slabs were made by pouring ready-mixed concrete into a series of forms at a central site. Later the slabs with the embedded risers were hauled to the location where they were to be used. The truck used to transport the slabs was equipped with an old bomb hoist to facili-

◀ Figure 1

exclusion of flies from human excreta. Applying the statistical method used by Francis (9) in evaluating the effectiveness of poliomyelitis vaccine, the bored-hole privy technique had an estimated effectiveness of 52 percent in reducing *Shigella* infection rates. This compares with 61 percent in Texas and 67 percent in Georgia when chemical fly control techniques were used. (The lower 95-percent confidence limits of findings in these areas were 33, 55, and 44 percent effectiveness, respectively.) In each of the

above studies, some *Shigella* was transmitted during the test period by the other mechanisms. The effectiveness of controlling these other mechanisms should be determined. Increased water availability would decrease the prevalence of dirty hands, for example.

Summary

All privies in Boston, Ga. (population 1,035), were reconstructed in the spring of 1952 by

Figure 2 ►

tate loading and positioning the slab over the hole.

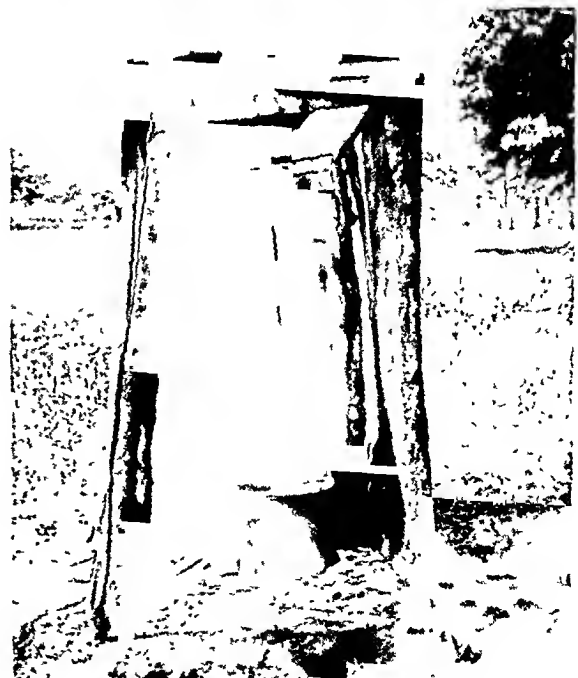
The aluminum riser, seat, and lid were a unit used by the Georgia Department of Public Health in their improvement programs. The riser was 14 inches in diameter with a stamped metal seat mounted at the top. The lid was hinged at the back and covered the hole and seat completely. It is recommended that the riser be redesigned in the shape of a truncated cone, with the projection to the rear, to minimize fouling.

Curbing of the hole in areas of high ground water is also recommended. In clay, the wall of the hole did not slough off, but if ground water came up to the topsoil, caving of the wall was noted.

The cost of a typical privy (fig. 3) was \$26.20. Of this, \$11.06 was for material and equipment and \$15.14 for approximately 12 hours of labor. This cost is itemized below.

| | |
|--|---------|
| Equipment..... | \$1.04 |
| Truck depreciation..... | 1.02 |
| Truck operation expense..... | 1.46 |
| A-frame and augers..... | .91 |
| Labor (0.53 hours)..... | .65 |
| Slab and riser..... | 10.41 |
| Forms..... | .12 |
| Concrete and steel..... | 2.70 |
| Aluminum riser, seat, and lid..... | 4.85 |
| Labor (1.94 hours)..... | 2.74 |
| Digging hole, setting slab, and moving old privy..... | 10.85 |
| Labor (8.97 hours, range 5-19 hours) | |
| Travel between privies..... | .90 |
| Labor (0.74 hour) | |
| Total..... | \$26.20 |

Figure 3 ►



drilling bored holes 8 feet deep. This markedly curtailed housefly breeding in privies but did not significantly reduce the housefly population in the community. Epidemiological observations were continued for 18 months following the privy remodeling. From rectal swab cultures taken monthly, a significant reduction of *Shigella* infections was observed in children less than 10 years old. Also, after improvements were made in the methods of excreta disposal in the community, the reported diarrheal disease rate in Boston was one-half the rate observed in the check towns.

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Medical Research Fellowships

The division of medical sciences of the National Academy of Sciences-National Research Council has announced a program of post-doctoral research fellowships for 1958-59. Applications for the fellowships, which will be awarded in the late winter, will be accepted until December 1, 1957.

The fellowships fall into three categories: the National Research fellowships in the medical sciences offering research experience in the basic medical sciences for persons preparing for careers in academic medicine and investigation; the Donner fellowships for medical research for full-time research at the fundamental level; and fellowships in radiological research, administered for the James Picker Foundation by the division's committee on radiology, for the development of research skills leading to investigative careers in the field of radiology.

Candidates for all three fellowships must hold an M.D., Ph.D., or Sc.D. degree or the equivalent, and should ordinarily not be more than 35 years of age. Applicants for the NRC and Donner fellowships must be citizens of the United States or Canada.

Details and application blanks may be obtained from the Division of Medical Sciences, National Academy of Sciences-National Research Council, 2101 Constitution Ave., NW., Washington 25, D. C.

The investigation of the Baton Rouge outbreak provides a model of procedures recommended by the International Association of Milk and Food Sanitarians.

An Outbreak of Gastroenteritis in a Louisiana School

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ON October 12, 1956, the Louisiana State Department of Health and the East Baton Rouge Parish Health Unit were alerted to an outbreak of "food poisoning" among the students of a Baton Rouge high school by a radio announcer broadcasting a night football game between the school and a school near Lake Charles.

Health authorities in Lake Charles and the supervisor of the Baton Rouge high school cafeteria were contacted immediately. The director of the Calcasieu Parish Health Unit, after investigation, reported that the students were being hospitalized in Lake Charles and Sulphur, La., that the attending physicians were of the opinion that the illness was food poisoning, and that some of the students said that they had become ill before leaving Baton Rouge. The supervisor of the cafeteria stated that a number of students became ill Friday morning, but that she and the school principal thought they had a virus infection and so did not report the occurrence to the Parish health unit. She also stated that none of the foods from the Thursday menu were available for samples and that all leftovers, as well as the cans and their labels, were destroyed.

Determining Origin

Saturday morning, the staff of the East Baton Rouge Parish Health Unit, headed by

Dr. David E. Brown, and the epidemiology team of the Louisiana State Department of Health began their investigation.

It was determined that most of the affected persons had onsets during Thursday night and Friday, suggesting a common source of illness on Wednesday or Thursday, October 10 or 11. The most likely common source was one of the noon meals served at the school cafeteria. A list of all persons preparing and handling food in the school cafeteria on Wednesday and Thursday and copies of the menus for these days were obtained.

A sanitation survey was made of the entire school plant as well as the food-handling area. Particular efforts were made to find evidence of cross connection or back siphonage in the water distribution system of the school. Water from the school is supplied by the Baton Rouge water works. A service line to the school issues from a 17-inch main. Water pressure is high and does not fluctuate. The water works company's records showed, moreover, that it had

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not had a service call from the school for several months nor had the water been cut off in that area for some time. The school authorities affirmed that there had been no plumbing or repair work at the school during the current term. Eight samples of water collected at different points on the first and second floors of the school building were reported negative for coliform organisms. Portions of the foods in stock were collected and submitted to the State department of health laboratory for bacteriological and toxicological studies.

Monday morning, October 15, questionnaires were distributed to the students and faculty at school with the request that they be completed and returned as quickly as possible. These questionnaires were designed to gather information of epidemiological significance. The support and help of the principal permitted completion of this task with ease by early afternoon.

The public health nurses contacted the food handlers and a number of the students Monday morning to obtain stool specimens for study. These were submitted to the State department of health laboratory to be studied for organisms of the food poisoning types.

A total of 1,103 questionnaires were completed and returned by 35 members of the

faculty and 1,070 students. The assistant principal advised us that 121 students were absent on this Monday compared with 95 on the preceding Monday. Two hundred sixteen persons did not eat any food in the school cafeteria on either Wednesday or Thursday, 16 drank only milk and 873 ate one or more of the items on the menu other than milk and in many instances including milk.

Of the 216 who did not eat in the cafeteria, 21 (9.6 percent) became ill between October 11 and October 14, with symptoms of gastroenteritis; 2 (12.5 percent) of the 16 who drank only milk had similar symptoms while 453 (51.8 percent) of the 873 who ate in the cafeteria had symptoms of gastroenteritis. Only 58 of 998 persons ate elsewhere with friends who were also made sick. Authorities of nearby schools revealed no unusual absenteeism. These findings indicated that the cause of the illness was associated with the school cafeteria.

During the study period, 83 persons were sick enough to see a doctor and 40 had to be hospitalized. The principal manifestations were nausea in 342 cases (78.8 percent), weakness in 285 (66.9 percent), vomiting in 194 (46.3 percent), fever in 189 (44.5 percent), diarrhea in 179 (42.5 percent), chilly sensations in 153 (36.5 percent), rigors in 36 (8.6 percent), and other

Table 1. Attack rates by category of food eaten in the cafeteria of a Baton Rouge high school, Oct. 10 and 11, 1956

| Noon meal | Persons eating food item | | | | Persons not eating food item | | | |
|---------------------------------|--------------------------|-----|------|-------------|------------------------------|-----|------|-------------|
| | Total | Ill | Well | Attack rate | Total | Ill | Well | Attack rate |
| <i>Oct. 10, 1956</i> | | | | | | | | |
| Meat loaf..... | 726 | 408 | 318 | 56.2 | 102 | 24 | 78 | 23.5 |
| Potatoes..... | 679 | 367 | 312 | 54.0 | 149 | 65 | 84 | 43.6 |
| Carrot salad..... | 388 | 244 | 144 | 62.9 | 440 | 188 | 252 | 42.7 |
| Apple pie..... | 728 | 381 | 347 | 52.3 | 100 | 51 | 49 | 51.0 |
| Bread..... | 732 | 384 | 348 | 52.5 | 96 | 48 | 48 | 50.0 |
| Milk..... | 786 | 406 | 380 | 51.7 | 42 | 26 | 16 | 61.9 |
| <i>Oct. 11, 1956</i> | | | | | | | | |
| Pork and gravy..... | 711 | 409 | 302 | 57.5 | 97 | 23 | 74 | 23.7 |
| Coleslaw..... | 353 | 229 | 124 | 64.9 | 445 | 203 | 242 | 45.6 |
| Green beans..... | 509 | 303 | 206 | 59.5 | 299 | 129 | 170 | 43.1 |
| Rice..... | 701 | 395 | 306 | 56.3 | 107 | 37 | 70 | 34.6 |
| Cake and chocolate pudding..... | 687 | 376 | 311 | 54.7 | 121 | 56 | 65 | 46.3 |
| Bread..... | 712 | 386 | 326 | 54.2 | 96 | 46 | 50 | 47.9 |
| Milk..... | 775 | 413 | 362 | 53.3 | 33 | 19 | 14 | 57.6 |

Table 2. Attack rates by combination of foods eaten in the cafeteria of a Baton Rouge high school, Oct. 10 and 11, 1956

| Food | Persons eating food item | | | |
|---|--------------------------|-----|------|-------------|
| | Total | Ill | Well | Attack rate |
| Meat loaf and/or pork and gravy..... | 804 | 444 | 360 | 55.2 |
| Meat loaf, no pork and gravy..... | 97 | 37 | 60 | 38.1 |
| Pork and gravy, no meat loaf..... | 81 | 37 | 44 | 45.7 |
| No meat loaf, no pork and gravy..... | 69 | 9 | 60 | 13.0 |
| Carrot salad, no meat loaf and no pork and gravy..... | 21 | 4 | 17 | 19.0 |
| Coleslaw, no meat loaf and no pork and gravy..... | 11 | 0 | 11 | 0 |
| No carrot salad, coleslaw, nor meat..... | 46 | 5 | 41 | 10.9 |
| Carrot salad and/or coleslaw, and both meats..... | 354 | 237 | 117 | 66.9 |
| Both meats but no carrot salad nor coleslaw..... | 272 | 133 | 139 | 48.9 |
| Carrot salad or coleslaw but no meat..... | 22 | 4 | 18 | 18.2 |

symptoms in 8 (1.8 percent). Of those affected, 29.2 percent were sick less than 1 day, 47.9 percent more than 1 day and less than 2 days, 16 percent more than 2 and less than 3 days, and 6.9 percent more than 3 days. As nearly as we can determine, the incubation period was 32 to 72 hours.

Attack Rates

Attack rates were calculated for the different foods eaten (tables 1 and 2). These rates suggested that some persons became ill from food eaten Wednesday and others from food eaten Thursday. Investigation revealed that the meat loaf served on Wednesday was prepared from fresh meat and canned pork and gravy. Canned pork and gravy from the same company, but not leftovers, was served on Thursday. The attack rates strongly suggested that the meat loaf, the pork and gravy, the carrot salad, the coleslaw, or all of these, may have been the offending food.

Analysis shows that the attack rate for those who ate meat loaf on Wednesday and pork and gravy on Thursday are very similar (56.2 percent and 57.5 percent). There is also a close correlation between attack rates of those persons who did not eat these foods (23.5 percent and 23.7 percent). The difference in attack rates is even more pronounced when a tabulation is made of those persons who ate either or both meat loaf and pork and gravy. About 55 percent of such persons became ill, whereas only 13 percent of those who ate neither food

became ill. By the development of other rates, we were able to exclude the salads as probable offending foods. The attack rate for those who had either the carrot or coleslaw salad, but neither meat dish, was 18.2 percent as compared with an attack rate of 48.9 percent for those persons who had both meats, but neither salad. The significance of these differences was tested and it was found that this difference would occur only once in a million times by chance alone.

We have now established that those persons who ate either or both meat loaf and pork and gravy in the school cafeteria on Wednesday or Thursday and became ill did so in a significantly greater number than those who did not eat those meats in the school cafeteria on the 2 days.

Since leftovers of the suspected foods were not available, similar foods of the same manufacturer's lot number were collected and tested by cultural methods, animal feeding, and by serving to human volunteers. No organisms were cultured from these foods and none of the test animals or test humans became ill. This suggests the probability of these foods being inoculated with a pathogenic agent or a toxic substance after opening of the can. Investigation failed to reveal any likelihood of contamination with an insecticide, rodenticide, or other chemical. No pathogenic agent was identified in any of the stool specimens submitted by each of the food handlers and a number of students.

Two persons prepared and two different persons served the meat loaf on Wednesday. Thursday, the cans of pork and gravy were

opened by 2 persons, cooked by 1 person, and served by 2 people. One of the persons who opened the cans of pork and gravy cooked this food on Thursday; she is also 1 of the 2 who prepared and cooked the meat loaf on Wednesday. One of the two persons who served the pork and gravy on Thursday also served the meat loaf on Wednesday. If the meat loaf and the pork and gravy were contaminated after opening of the cans of pork and gravy, it seems likely that one of these two people inoculated the pork and gravy, and most probably it was the person who prepared and cooked the meat loaf and the pork and gravy. This is a supposition, not an established fact, however, as none of the usual food poisoning organisms were cultured from the persons who were ill or from the food handlers. This might be accounted for, however, by the failure to suspect the saprophytic organisms such as *Escherichia coli* or *Bacillus proteus* as a cause of the outbreak and to do the studies necessary for identifying these organisms. The possibility of a virus being the offending organism must also be considered as virus isolation studies were not performed. Also, the stool specimens submitted may not have been from the person submitting the specimen, especially if that person had recently been ill of a diarrheal disease and was afraid of being incriminated. Unfortunately, dyed lycopodium spores were not given to the suspected food handlers to allow identification of the stool specimens submitted. As the stool specimens submitted are subject to question, so is the illness history of the food handlers.

On a return visit to the school cafeteria, several kitchen workers were questioned. Evidence gathered suggested that some foods are being held over from one day to the next and served. On October 17, 1956, approximately 50 pounds of pork and gravy were found. This had just been removed from the freezer and was being discarded in the garbage. We were not able to determine whether this batch of pork and gravy was part of that which was served on Thursday. Samples were collected and submitted to the laboratory for study. No food poisoning organisms were isolated.

Summary and Recommendations

In summary, 51.8 percent of those persons who had their noon meal in a high school cafeteria in Baton Rouge on either or both Wednesday and Thursday, October 10 and 11, 1956, became ill with gastroenteritis after an incubation period of approximately 32 to 72 hours. Presumably the offending foods were meat loaf (containing pork and gravy) and pork and gravy. How these foodstuffs became contaminated and the identity of the infective agent was never established.

The following recommendations are the result of the investigation:

- Any disease occurrence of unusual magnitude or severity, regardless of what is thought to be the cause, should immediately be reported to the health officer having jurisdiction.

- When food is suspected as the vehicle of infection, every effort should be made to secure representative samples of the suspected food. When available, samples should be taken from the leftovers on plates of those affected as well as from the bulk food and submitted to the laboratory for cultural and toxico-chemical studies.

- Specimens of the vomitus and stools of patients suspected of being ill from ingestion of a suspected food should be collected and submitted to the laboratory for isolation of food poisoning or food infection micro-organisms or of a toxic substance.

- We should broaden our concept of food poisoning to include food infection by other agents which we have long believed to be saprophytic, but which recent investigations have demonstrated or suggested to be the causative agents of gastroenteritis.

- In addition to the usual sanitary inspection of plant and equipment we should concentrate our educational and investigational efforts on food-handling practices so as to establish and maintain safe methods of operation.

- The person responsible for the operation of a food-handling establishment should be taught the importance of a daily investigation of the health status of each of his employees and should be expected to exclude from work any individual who is sick or who has a discernible skin infection.

Accuracy of the Reported Causes of Fetal and Neonatal Deaths

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CAUSE-OF-DEATH statistics obtained from fetal and neonatal death certificates provide a means by which health departments can contribute to investigations of perinatal wastage. It is important, therefore, to be aware of the limitations of such statistics.

This paper reports a study of the accuracy of the causes of perinatal deaths given on death certificates submitted to the Baltimore City Health Department by the Johns Hopkins Hospital during 1953 (calendar year). One hundred and twenty-seven deaths are included; 50 were fetal deaths, and 77 were early neonatal deaths (70 during the first week of life and 7 during the second week).

An investigation of the accuracy of the reported causes of perinatal deaths implies that there is available a statement of the real cause of death with which the reported cause can be compared. No claim is made that the true cause of death was known for each of the deaths in this study, but it was possible to obtain a reasonably good substitute.

During 1953 the perinatal autopsy rate at the Johns Hopkins Hospital approached 100 percent. The pathological data obtained at autopsy and the clinical history for each death in this study were reviewed by obstetricians and pediatricians at an infant mortality conference. The results of the conference discussion, to-

gether with the pathology report and the clinical history, were used as a basis for determining the cause of the fetal or neonatal loss. This cause was posted to a death certificate, designated the "special certificate," of the type used by the Baltimore City Health Department in 1953. For this study, it was assumed that the information recorded on the special certificate represented the best available approximation of the true cause of death.

The original certificate for each death was in the files of the Baltimore City Health Department and was not seen by the physician who completed the special certificate. The physician who completed the original certificate had access only to the clinical history and possibly gross pathological findings. Exactly what information was used in preparing each of the original certificates is not known.

All causes of death were coded in accordance with the International Statistical Classification of Diseases, Injuries, and Causes of Death (sixth revision). The special certificates were coded by the same nosologist who had coded the original certificates in 1953.

Accuracy of the original certificates was measured by the percentage of the deaths studied in which the reported cause agreed with the cause given on the special certificate. Agreement was determined from a comparison of the international statistical classification code numbers assigned to the causes given on the special and the original certificates.

For fetal deaths two degrees of agreement were established. The first, which represents a high degree of matching, required agreement in the first two digits of the code. For example, a certificate ascribing a fetal death to difficult

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labor with abnormality of the bones of the pelvis, coded Y34.0, was considered in agreement with its companion certificate if it attributed death to difficult labor without mention of the underlying condition, coded Y34.6. The second, and more liberal appraisal of agreement, was based on three broad groups of causes of fetal death, namely, causes and conditions in the mother; causes determined in fetus, placenta, and cord; and unknown or ill-defined causes.

Agreement for the causes of neonatal death was determined from a comparison of the special and original certificates according to the rubrics used in the annual report of the Baltimore City Health Department for 1953. These rubrics were as follows: congenital malformation, birth injury, postnatal asphyxia and atelectasis, infection of the newborn, hemolytic and hemorrhagic disease of the newborn, immaturity, and all other causes. The analysis of the accuracy of the causes of neonatal death was complicated by the fact that the classification hyaline-like membrane appeared on the special certificates but was not used at the time the original certificates were prepared.

Fetal Deaths

Agreement between the special and original certificates was 60 percent for fetal deaths; that is, the causes agreed for 30 of the 50 cases stud-

ied (table 1). Sixteen of the special certificates ascribed fetal death to causes and conditions in the mother. Of these, only six were matched by the causes given on the original certificates. Thus, the percentage agreement for this group of causes was about 38. Five of the unmatched cases were in the category "toxemias"; two were in "difficulties in labor"; one was in "chronic disease"; and the remaining two deaths were attributed to other causes and conditions in the mother.

There were 18 fetal deaths ascribed on the special certificates to causes determined in fetus, placenta, and cord. Thirteen, or 72 percent, of the original certificates for these deaths gave the same cause. Premature separation of the placenta was the cause for 3 of the 5 nonmatching cases.

For the 16 deaths from unknown or ill-defined causes, 11, or 69 percent, were assigned to this category on the basis of the original certificates. Three of the five nonmatching deaths were ascribed to causes and conditions in the mother on the original certificates.

These results indicate that fetal deaths due to causes and conditions in the mother are inaccurately reported more frequently than deaths due to conditions determined in the fetus. However, the size and scope of this study are such that this generalization must be considered guardedly. The 50 fetal deaths

Table 1. Comparison of the causes of fetal death given on special and original death certificates, Baltimore City, Md., 1953

| Cause of death according to special certificate ¹ | Total | Cause of death according to original certificate | | | | | | | | | |
|--|-------|--|----|----|----|----|----|----|----|----|----|
| | | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | B5 | C |
| Total..... | 50 | 2 | 4 | 1 | 3 | | 11 | 4 | 1 | 1 | 23 |
| A. Causes and conditions in mother. | | | | | | | | | | | |
| 1. Chronic disease (30 0-30 5)--- | 3 | 2 | | | | | | | | -- | 1 |
| 2. Toxemias (32.3, 32 4)----- | 7 | | 2 | | | | 1 | | | | 4 |
| 3. Difficulties in labor (34 0-34 6)--- | 2 | | | | | | | | | | 2 |
| 4. Other (31.0-31.4, 32 0, 32 2, 32.5, 35 0-35 2) -- | 4 | | | | 2 | | | | | | 2 |
| B. Causes determined in fetus, placenta, and cord | | | | | | | | | | | |
| 1. Placenta previa (36 1, 36 3)----- | 1 | | | | | | 1 | | | | |
| 2. Premature separation (36 2, 36 4)---- | 11 | | 1 | | | | 8 | | | | 2 |
| 3. Other placenta and cord (36 0, 36 5, 36 6) - | 4 | | | | | | | 4 | | | |
| 4. Congenital malformation (38 0-38.7)--- | 1 | | | | | | | | 1 | | |
| 5. Erythroblastosis (39 2)----- | 1 | | | | | | | | | | 1 |
| C. Unknown or ill-defined (35 3, 39.4-39.6)----- | 16 | | 1 | 1 | 1 | | 1 | | | 1 | 11 |

¹ Numbers in parentheses are international statistical classification code numbers, with Y prefix omitted.

Table 2. Number and percentage of fetal deaths by cause for study deaths and all deaths¹ in Baltimore City, Md., 1953

| Cause of death ² | Number | | | Percent | | |
|---|---------------------|----------------------|----------------|---------------------|----------------------|----------------|
| | Study | | Baltimore City | Study | | Baltimore City |
| | Special certificate | Original certificate | | Special certificate | Original certificate | |
| All causes----- | 50 | 50 | 391 | 100.0 | 100.0 | 100.0 |
| Causes and conditions in mother----- | 16 | 10 | 65 | 32 | 20 | 16.6 |
| Chronic disease (30.0-30.5)----- | 3 | 2 | 11 | 6 | 4 | 2.8 |
| Toxemias (32.3, 32.4)----- | 7 | 4 | 28 | 14 | 8 | 7.2 |
| Difficulties in labor (34.0-34.6)----- | 2 | 1 | 11 | 4 | 2 | 2.8 |
| Other (31.0-31.4, 32.0, 32.2, 32.5, 35.0-35.2)----- | 4 | 3 | 15 | 8 | 6 | 3.8 |
| Causes determined in fetus, placenta, and cord----- | 18 | 17 | 145 | 36 | 34 | 37.1 |
| Placenta previa (36.1, 36.3)----- | 1 | 0 | 0 | 2 | 0 | 0 |
| Premature separation (36.2, 36.4)----- | 11 | 11 | 76 | 22 | 22 | 19.4 |
| Other placenta and cord (36.0, 36.5, 36.6)----- | 4 | 4 | 35 | 8 | 8 | 9.0 |
| (38.0-38.7)----- | 1 | 1 | 17 | 2 | 2 | 4.3 |
| Birth injury (37.0-37.8)----- | 1 | 1 | 16 | 2 | 2 | 4.1 |
| | 0 | 0 | 1 | 0 | 0 | 0.3 |
| Unknown or ill-defined (35.3, 39.4-39.6)--- | 16 | 23 | 181 | 32 | 46 | 46.3 |

¹ Deaths after 20 weeks or more gestation.

² Numbers in parentheses are international statistical classification code numbers, with Y prefix omitted.

were purposively selected from a total of 391 deaths (20 weeks or more gestation) that occurred in Baltimore City during 1953. Moreover, they are all from one teaching hospital. It is of interest, therefore, to compare the distribution of the causes for the study deaths with the distribution of the causes for all fetal deaths in the city during the same period. The comparative data are shown in table 2.

Twenty percent of the study deaths were ascribed to causes in the mother on the original certificates, compared with 16.6 percent of all fetal deaths. For causes in the fetus, placenta, and cord, the percentages were 34 for the study group and 37.1 for all deaths; for unknown or ill-defined causes, they were 46 and 46.3. Thus, for these broad groups the largest percentage difference between the study deaths and all deaths is less than 4. It seems fair to say, therefore, that, with respect to causes of death, the sample is representative of the total fetal death experience in Baltimore during 1953.

A comparison of the percentage distributions of the causes given on the special, the original, and all certificates shows the following:

1. Fetal deaths were ascribed to causes and conditions in the mother about twice as often on the special certificates as on either the original certificates or on the certificates for all fetal deaths.

2. The frequency of causes determined in fetus, placenta, and cord was about the same for the three sets of certificates.

3. Fetal deaths ascribed to unknown or ill-defined causes were more frequent on the original certificates and on the certificates for all deaths than they were on the special certificates.

These findings suggest that in tabulations of fetal deaths by cause there is a tendency to underestimate the importance of maternal conditions as a primary factor in fetal loss.

Neonatal Deaths

For neonatal deaths, agreement between the special and original certificates was observed in

only 27, or 35 percent, of the 77 cases studied (table 3). One of the major reasons for this relatively low percentage agreement, however, is that the rubric hyalinelike membrane (code 527) was not used in 1953 when the original certificates were coded. If the 18 special certificates that give this cause are omitted, the percentage agreement becomes 46 (27 of 59 deaths).

It is interesting that of the 18 deaths ascribed to hyalinelike membrane on the special certificates, 9 were originally attributed to postnatal asphyxia and atelectasis, a cause which at the time was reasonable for deaths that might now be listed as due to hyalinelike membrane. Of the other 9 deaths due to hyalinelike membrane, 4 were originally ascribed to birth injury, 4 to immaturity, and 1 to "all other causes."

Of the causes of neonatal death, there were only two in which the percentage agreement between the special and original certificates was relatively high. These were congenital malformations and hemolytic and hemorrhagic disease of the newborn. In the rubric birth injury, only 5 of the 14 special certificates were matched by the original certificates; 5 were originally ascribed to postnatal asphyxia and atelectasis and 4 to immaturity. Of the 7 deaths assigned to asphyxia and atelectasis on the special certificates, 4 were matched and 3 were originally listed as due to immaturity.

Not quite one-half of the deaths attributed to infection of the newborn on the special certificates were similarly designated on the original records; 6 of the 16 deaths from this cause were reported as due to immaturity. Immaturity did not appear as a cause of death on the special certificates.

Although the supporting data are not shown in table 3, it was observed that the percentage agreement between the special and original certificates was markedly different for mature and premature infants. In the group of 58 infants whose birthweight was less than 2,500 gm., matching causes were found on only 11 sets of certificates, or 19 percent. For infants whose birthweight was 2,500 gm. or more, on the other hand, there was agreement for 14 of the 19 cases, or 74 percent. Part of this difference is associated with the fact that hyalinelike membrane was given as the cause of death for more than one-half of the premature infants.

A comparison of the causes for the neonatal deaths in the study with the causes for all neonatal deaths reported among Baltimore City residents in 1953 is shown in table 4. Postnatal asphyxia and infection of the newborn were found more frequently as causes of neonatal death among the original certificates for the study group than among all the certificates for 1953. Deaths due to immaturity were found less frequently among the original study certificates.

Table 3. Comparison of the causes of neonatal death given on special and original death certificates, Baltimore City, Md., 1953

| Cause of death according to special certificate ¹ | Total | Cause of death according to original certificate | | | | | | | |
|--|-------|--|---|----|----|---|---|----|---|
| | | A ² | B | C | D | E | F | G | H |
| Total.. | 77 | | 9 | 10 | 23 | 8 | 2 | 21 | 4 |
| Total excluding deaths due to hyalinelike membrane---- | 59 | | 9 | 6 | 14 | 8 | 2 | 17 | 3 |
| A. Hyalinelike membrane (527)----- | 18 | | | 4 | 9 | | | 1 | 1 |
| B. Congenital malformations (750-759)----- | 10 | | 8 | | 1 | | 1 | | |
| C. Birth injury (760-761)----- | 14 | | | 5 | 5 | | | 4 | |
| D. Postnatal asphyxia and atelectasis (762)----- | 7 | | | | 4 | | | 3 | |
| E. Infection of newborn (763-768)----- | 16 | | | 1 | 1 | 7 | | 6 | 1 |
| F. Hemolytic and hemorrhagic disease of newborn (770-771)----- | 1 | | | | | | 1 | | |
| G. Immaturity (774, 776)----- | 1 | | | | | | | | |
| H. All other causes----- | 11 | | 1 | | 3 | 1 | | 1 | 2 |

¹ Numbers in parentheses are international statistical classification code numbers

² Hyalinelike membrane was not used when original certificates were filled out.

Table 4. Number and percentage of neonatal deaths, by cause for study deaths and all deaths,¹ Baltimore City, Md., 1953

| Cause of death ² | Number | | | Percent | | |
|---|------------------------|-------------------------|------------------------|------------------------|-------------------------|------------------------|
| | Study | | Balti- more City | Study | | Balti- more City |
| | Special certificate | Original certificate | | Special certificate | Original certificate | |
| All causes ----- | 77 | 77 | 449 | 100. 0 | 100. 0 | 100. 0 |
| Hyalinelike membrane (527) ----- | 18 | 0 | 0 | 23. 4 | 0 | 0 .4 |
| Congenital malformations (750-759) ----- | 10 | 8 | 41 | 13. 0 | 10. 4 | 9. 1 |
| Birth injury (760-761) ----- | 14 | 11 | 69 | 18. 2 | 14. 3 | 15. 4 |
| Postnatal asphyxia and atelectasis (762) ----- | 7 | 23 | 96 | 9. 1 | 29. 8 | 21. 4 |
| Infection of newborn (763-768) ----- | 16 | 8 | 20 | 20. 8 | 10. 4 | 4. 5 |
| Hemolytic and hemorrhagic disease of newborn (770-771) ----- | 1 | 2 | 9 | 1. 3 | 2. 6 | 2. 0 |
| Immaturity (774, 776) ----- | 0 | 20 | 191 | 0 | 26. 0 | 42. 5 |
| All other causes ----- | 11 | 5 | 23 | 14. 2 | 6. 5 | 5. 1 |

¹ Resident deaths during the first week of life.

² Numbers in parentheses are international statistical classification code numbers.

Although use of the rubric hyalinelike membrane on the special certificates makes it difficult to compare these with the other two sets, two features of the data are discernible. First, infection of the newborn was found more frequently on the special certificates than on the original certificates for the study group or on all the 1953 certificates: The percentages are 20.8, 10.4, and 4.5, respectively. Second, immaturity, which was not given as a cause of neonatal death on the special certificates, appeared on a relatively large percentage of the original certificates and on an even larger percentage of all certificates.

Discussion

In this study the causes of death reported on about 40 percent of the original fetal death certificates failed to match the causes given on special certificates. For neonatal deaths not attributed to hyalinelike membrane, about 56 percent of the original certificates gave a cause of death that did not agree with the cause posted to special certificates. These estimates relate to the experience of only one hospital, but there is evidence that the deaths studied represent the total experience of the city reasonably well. Thus, the implication is that inaccuracies of the same magnitude exist in the

tabulations of citywide perinatal deaths by cause.

One might speculate about how much death certificate data are affected by inaccurate or incomplete reports of clinical findings, by different interpretations of accurately reported findings, by the zeal of those filling out the certificates, or by differences that arise when coders transform a written diagnosis into the symbols used to prepare punchcards for statistical analysis. But a study as limited as this one cannot identify or appraise such factors precisely.

The indication that inaccuracies exist is not in itself particularly valuable information. What is of more interest to both producers and consumers of death certificate data is the nature of the inaccuracies and the practical measures that can be taken to prevent them.

With regard to the first point, this study indicates that fetal deaths due to causes and conditions in the mother actually occur about twice as often as is shown on death certificates. For neonatal deaths, the data suggest that, apart from deaths due to hyalinelike membrane, infection of the newborn is the most frequently under-reported cause of death.

With regard to the measures that can be taken to improve the quality of death certificate information, it is necessary to keep in mind the

nature of the inaccuracies and to note the characteristics of the special and original certificates that might have a bearing on the inaccuracies. Recall that the physician preparing the special certificate had at hand the clinical history, a detailed report of pathology, and the results of an infant mortality conference. Moreover, he was aware that a test of accuracy was in progress. Contrast this situation with that which probably existed at the time the original certificate was completed. The clinical history was available on request, but only gross findings of the autopsy, if any at all, could be obtained. In addition, the physician completing the original certificate was not under test conditions, although he did know that his report would be made part of a clinical history which would be reviewed at an infant mortality conference.

These considerations indicate that inaccuracies in the original certificates could have arisen as follows: For fetal deaths, although pathological data could have been used to eliminate several possible causes, it seems likely that inaccuracies involving causes in the mother can be attributed to inadequate study of the available information. For neonatal deaths, where under-reporting of infection of the newborn was the most striking finding, a stronger case can be made for the necessity of having pathological data. This is certainly true if hyaline-like membrane is to be used in a meaningful way as a cause of neonatal death.

Thus, this study suggests that the quality of death-certificate data for perinatal deaths could be improved by a more intensive study of available clinical records and by the use of

pathological data, especially in assigning causes of death during the neonatal period of life. The first of these recommendations might be implemented by holding periodic conferences with resident obstetrical staff, preferably timed to coincide with the beginning of the term of a new residency, and by making frequent checks of the completeness of fetal and neonatal death certificates. The second could be supported by querying the certifying physician or the hospital in all cases in which there is an indication that an autopsy has been performed.

Summary

A study of 50 fetal and 77 neonatal death certificates submitted to the Baltimore City Health Department by the Johns Hopkins Hospital during 1953 found that some 40 to 50 percent of the cause-of-death statements did not agree with those posted to special certificates based on careful examination of the clinical history, a detailed pathological report, and the findings of an infant mortality conference. The study indicates that deaths due to maternal conditions and causes are under-reported among fetal deaths and that deaths due to infection of the newborn are under-reported among neonatal deaths.

Consideration of the nature of the inaccuracies in conjunction with the conditions under which the original and special certificates were prepared suggests that the quality of death certificate information about perinatal deaths might be improved by a more intensive study of the clinical data and by use of autopsy findings.

Evaluation of the Suessenguth-Kline Test for Trichinosis

H. SUESSENGUTH, B.S., A. H. BAUER, B.S., and A. M. GREENLEE, D.V.M., M.P.H.

TRICHINOSIS affects an estimated 16 per cent of the population of the United States, according to examinations of muscle tissue for trichinae larvae (1). The majority of infections are subclinical, but even those with clinical symptoms frequently escape recognition. The high prevalence, the manner of transmission, the frequent severity, and occasional fatal outcome of the disease make trichinosis a matter of public health concern.

Clinical diagnosis of this disease is difficult (2). Some laboratory examinations are helpful only if positive, while others show conflicting results (1, 3-5). A simple and rapid flocculation slide test for the disease was reported by Suessenguth and Kline (6) and subsequently improved (7). Because of encouraging results in the previous studies, it was decided to determine the value of the test for public health and diagnostic laboratory purposes. The test was studied for simplicity of performance, for reproducibility, for sensitivity and specificity, and in comparison with one other immunological method of testing.

Simplicity of Performance

It had been found in an earlier study (6) that an alkaline aqueous extract of freeze-dried trichinae larvae possesses the property of coating cholesterol crystals so that, when such coated crystals are dispersed in physiological saline, an antigen emulsion is formed. When used in the slide test, the antigen emulsion is sensitive and specific for trichinosis. The freeze-dry method has been found invariably satisfactory for drying larvae. Properly

stored larvae used over a period of 9 years showed no loss of sensitivity or specificity when compared with recently prepared larvae.

In performing the test, 0.5 cc. of the serum to be tested is placed on a ringed slide, one capillary drop of the antigen emulsion is added, and the mixture is rotated at 120 r.p.m. for 4 minutes. The paraffin wall of the ring effectively retains the ingredients. Results are read microscopically by the degree of flocculation of the coated crystals. The technique is essentially that of the Kline test for syphilis (8).

The test method is simple and rapid. It does not require highly trained personnel for performance. When refrigerated, the antigen emulsion is satisfactory for a period of at least 8 months.

Reproducibility

The reproducibility of the test was determined by examining duplicate portions of 1,216 serum specimens in two different laboratories. The specimens were from suspected trichinosis cases and from random samples of blood sub-

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nature of the inaccuracies and to note the characteristics of the special and original certificates that might have a bearing on the inaccuracies. Recall that the physician preparing the special certificate had at hand the clinical history, a detailed report of pathology, and the results of an infant mortality conference. Moreover, he was aware that a test of accuracy was in progress. Contrast this situation with that which probably existed at the time the original certificate was completed. The clinical history was available on request, but only gross findings of the autopsy, if any at all, could be obtained. In addition, the physician completing the original certificate was not under test conditions, although he did know that his report would be made part of a clinical history which would be reviewed at an infant mortality conference.

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Thus, this study suggests that the quality of death-certificate data for perinatal deaths could be improved by a more intensive study of available clinical records and by the use of

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Consideration of the nature of the inaccuracies in conjunction with the conditions under which the original and special certificates were prepared suggests that the quality of death certificate information about perinatal deaths might be improved by a more intensive study of the clinical data and by use of autopsy findings.

Table 2. Comparison of results of testing 122¹ serum specimens for trichinosis by both S-K flocculation slide and complement fixation methods

| Reactions to S-K flocculation slide test | Reactions to complement fixation test | | |
|--|---------------------------------------|-----------------|----------|
| | Positive | Weakly positive | Negative |
| Positive..... | 14 | 0 | 21 |
| Weakly positive..... | 1 | 0 | 6 |
| Negative..... | 1 | 0 | 72 |

¹ 17 specimens were anticomplementary in the complement fixation test. 2 of these were negative in the slide test, 1 was doubtful, and 4 were positive.

tive test results was diagnosed as trichinosis. In two of these cases there had been exposure to trichinous meat, but clinical symptoms were not found. Pertinent data on these cases are summarized below:

| | Number of cases |
|--|-----------------|
| Muscle pains..... | 11 |
| Vague or positive clinical findings..... | 10 |
| Eosinophilia..... | 5 |
| Had trichinosis 3-10 years before..... | 3 |
| Mental symptoms..... | 2 |
| Other parasitic infection (1 <i>Leptospira</i> ; 1 <i>Tacnia saginata</i>)..... | 2 |
| Exposed to trichinous meat; negative clinically..... | 2 |
| Total..... | 35 |

Although the number of suspected cases on which data were available for analysis was not large, results of this analysis corroborate the high degree of sensitivity and specificity previously reported (6) for the S-K flocculation slide test for trichinosis.

Comparison With CF Test

To compare results of the S-K flocculation slide test with those of another immunological test method, 122 specimens were examined by both the flocculation slide and the complement fixation tests. Portions of the specimens were sent to the Communicable Disease Center, Public Health Service, for the complement fixation tests.

Results of the two tests are compared in table 2. Seven specimens were anticomplementary by the complement fixation technique;

87 (71.4 percent) showed complete or partial agreement; and 28 specimens (22.9 percent) showed complete or partial disagreement.

Since disagreement was largely between positive or weakly positive reactions in the slide test and negative reactions in the complement fixation test, it was decided to determine whether test reactions were specific or nonspecific by examining case histories.

Case histories of 57 patients, accounting for 78 of the 122 specimens (for some cases more than one specimen was examined), were available for study. Table 3 compares test results for these 57 cases by type of case as determined by the diagnoses reported in the case histories.

Both tests gave negative results for 30 of the 31 cases diagnosed as diseases other than trichinosis; the remaining case was negative by flocculation slide and anticomplementary by complement fixation. The other 26 of the 57 were cases of diagnosed trichinosis—6 sporadic and 20 epidemic. Of these 26 trichinosis cases, 11 were positive and 2 were negative in both tests, 2 were positive in the slide test and anticomplementary in the complement fixation test, and 11 were positive in the slide test but negative in the complement fixation test.

Table 3. Comparison of reactions to S-K flocculation slide and complement fixation tests for trichinosis of serum specimens representing 57 clinically diagnosed cases

| Type of case and reaction to S-K flocculation slide test | Reaction to complement fixation test | | |
|--|--------------------------------------|----------|-------------------|
| | Positive | Negative | Anticomplementary |
| Other than trichinosis (31): | | | |
| Positive..... | 0 | 0 | 0 |
| Negative..... | 0 | 30 | 1 |
| Trichinosis—sporadic (6): | | | |
| Positive..... | 3 | 2 | 1 |
| Negative..... | 0 | 0 | 0 |
| Trichinosis—epidemic (20): | | | |
| Positive..... | 8 | 9 | 1 |
| Negative..... | 0 | 2 | 0 |

¹ Specimens from 4 cases were negative 1 month and positive subsequently on the complement fixation test.

² Specimens from 2 cases were negative 1 month and positive subsequently on the flocculation slide test.

mitted for routine tests for syphilis. The tests were performed over a period of 3 years; thus, several lots of antigen emulsion were used.

Each serum specimen was tested in both the division of laboratories of the Ohio Department of Health, Columbus, and the department of laboratories, Mt. Sinai Hospital, Cleveland. When quantity of the specimen permitted, the titer of each positive serum also was determined in duplicate.

The results of the study of reproducibility of the test showed excellent agreement (table 1). The duplicate tests of 97.1 percent of the specimens agreed completely (96 positive, 44 weakly positive, and 1,041 negative in both), and 1.1 percent showed partial agreement (positive in one laboratory and weakly positive in the other).

Quantity permitted duplicate titration of 42 positive serums. We considered 38 of these in agreement since they showed no more than a 1-tube difference. The complete results of duplicate titration of these serums were as follows:

| | Number of serums |
|----------------------------------|---------------------|
| Same titer..... | 23 |
| 1-tube difference..... | 15 |
| 2-tube difference..... | 4 |
| More than 2-tube difference..... | 0 |
| Total..... | 42 |

Sensitivity and Specificity

While simplicity of performance and reproducibility of a test are important, sensitivity and specificity are the factors determining its

Table 1. Comparison of results of duplicate tests for trichinosis on 1,216 serum specimens using the Svessenguth-Kline flocculation slide test

| Reactions at Mt. Sinai laboratory | Reactions at Ohio Department of Health laboratory | | |
|--------------------------------------|--|--------------------|----------|
| | Positive | Weakly positive | Negative |
| Positive..... | 96 | 9 | 2 |
| Weakly positive..... | 4 | 44 | 5 |
| Negative..... | 0 | 15 | 1,041 |

usefulness in medical practice. By questionnaires and investigations of trichinosis epidemics, pertinent clinical and laboratory data were obtained for the evaluation of positive test results (sensitivity) and negative test results (specificity).

The division of laboratories of the Ohio Department of Health tested 306 serum specimens for this portion of the study. These specimens were taken from patients who either showed some clinical symptoms, had presumptive laboratory findings, or were suspected of having trichinosis because they were members of family groups suffering epidemic trichinosis. Of the 306 specimens tested, 108 (35.3 percent) showed some degree of positivity, and 198 (64.7 percent) gave negative test results.

From questionnaires to attending physicians and investigations of epidemics, data were available for analysis of 62 cases for both sensitivity and specificity. The test had shown some degree of positivity for 27 and negative results for 35 of these 62 cases.

Of the 27 cases showing positivity, 25 were diagnosed cases of trichinosis. The 27 cases giving positive results on the test are described below:

| | Number positive |
|--|--------------------|
| Diagnosed as trichinosis..... | 25 |
| Larvae in meat ingested..... | 17 |
| Positive clinical findings and eosinophilia..... | 8 |
| Diagnosed as other than trichinosis..... | 2 |

One of the two cases not diagnosed as trichinosis was diagnosed as *Strongyloides stercoralis* infection. *S. stercoralis* was found in duodenal drainage; there was an eosinophilia of 50 percent; and the flocculation slide test was weakly positive. This was probably a non-specific, weakly positive reaction. The other case not diagnosed as trichinosis was given a final diagnosis of "chronic brain syndrome associated with convulsive disorder," although the diagnosis is questionable considering the history and laboratory findings. The patient was a cook and had had trichinosis in 1946; the eosinophil count was 1.2 percent; a skin test for trichinosis was positive; and a complement fixation test was negative. In this case the reaction may or may not have been nonspecific.

None of the 35 cases which had shown nega-

Milk Sanitation Honor Roll for 1955-57

Eighty-five communities have been added to the Public Health Service milk sanitation "honor roll," and 53 communities on the previous list have been dropped. This revision covers the period from June 1, 1955, to June 30, 1957, and includes a total of 263 cities and 54 counties.

Communities on the honor roll have complied substantially with the various items of sanitation contained in the milk ordinance suggested by the U. S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk is sold.

The suggested milk ordinance, on which the milk sanitation ratings are based, is now in effect through voluntary adoption in 475 counties and 1,397 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 12 States and the 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated in the suggested ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the

This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing was published in Public Health Reports, March 1957, pp. 275-278. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.

suggested ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

The rules for inclusion of a community on the "honor roll" are:

1. All ratings must be determined by the State milk sanitation authority in accordance with the Public Health Service rating method, which is based upon the grade A pasteurized milk and the grade A raw milk requirements of the Public Health Service milk ordinance. (A departure from the method described consists of computing the pasteurized milk rating by weighting the pasteurization plant rating twice that of the raw milk intended for pasteurization.)

2. No community will be included

on the list unless both its pasteurized milk and its retail raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the retail raw milk rating is 90 percent or more.

3. The rating used will be the latest submitted to the Public Health Service, but no rating will be used which is more than 2 years old. (In order to promote continuous rigid enforcement rather than occasional "cleanup campaigns," it is suggested that, when the rating of a community on the list falls below 90 percent, no resurvey be made for at least 6 months. This will result in the removal of the community from the subsequent semiannual list.)

4. No community will be included on the list whose milk supply is not under an established program of official routine inspection and laboratory control provided by itself, the county, a milk control district, or the State. (In the absence of such an official program, there can be no assurance that only milk from sources rating 90 percent or more will be used continuously.)

5. The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. (If the check rating is less than 90 percent, but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary period shows a rating of 90 percent or more. If the check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for 2 years from the date of the check survey, unless a subsequent rating during this period warrants its removal.)

On the basis of this comparison of test results with case data, it may be concluded that the S-K flocculation slide test is more sensitive for trichinosis than the complement fixation test. An additional advantage of this flocculation slide test is the absence of anticomplementary reactions.

Further studies of the S-K test and its antigen are in order, together with additional comparison with complement fixation tests and also with a recently described flocculation test (9) utilizing bentonite particles.

Summary

Because of frequent difficulty in clinical and laboratory diagnosis of trichinosis, there is need for a simple, rapid, and reliable diagnostic test for the disease. The Suessenguth-Kline flocculation slide test for trichinosis is simple and rapid. An antigen emulsion made of cholesterol crystals coated with an alkaline extract of lyophilized trichinae larvae is mixed on a slide with the serum to be tested and rotated for 4 minutes. The result is read microscopically by the degree of flocculation of the coated crystals.

The reproducibility of the flocculation slide test was shown by the 97.1 percent complete agreement and 1.1 percent partial agreement of the results obtained in two laboratories where duplicate tests were performed on 1,216 serum specimens.

An analysis of 62 cases showed the test to have a high degree of sensitivity and specificity. Of 27 positive test results, 25 were for cases diagnosed as trichinosis; for 1 of the other 2 cases, the diagnosis can be regarded as incon-

clusive. Of 35 negative test results, none were for cases diagnosed as trichinosis; although there had been definite exposure to trichinous meat in 2 cases, no clinical symptoms of the disease were evident.

In a comparison of the S-K flocculation slide test with the complement fixation test, the flocculation slide test showed greater sensitivity. It gave positive results for 11 diagnosed cases of trichinosis for which the complement fixation method gave negative results.

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Communities awarded milk sanitation ratings of 90 percent or more, July 1955-June 1957—Con.

100 PER CENT MARKET MILK PASTEURIZED

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|-------------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------|
| <i>North Carolina</i> | | <i>Tennessee—Con.</i> | | <i>Virginia</i> | |
| Camden County..... | 7- 5-1956 | Huntingdon..... | 10-29-1956 | Blacksburg..... | 8-16-1956 |
| Charlotte..... | 5- 7-1956 | Jackson..... | 6-20-1956 | Bristol..... | 11- 3-1955 |
| Chowan County..... | 7- 5-1956 | Jefferson City..... | 8-20-1956 | Buena Vista..... | 10-28-1955 |
| Craven County..... | 1-20-1956 | Kingsport..... | 11- 9-1955 | Christiansburg..... | 8-16-1956 |
| Cumberland County..... | 3-16-1956 | Knoxville..... | 8-26-1955 | Front Royal..... | 11-10-1955 |
| Durham County..... | 8- 7-1956 | Lewisburg..... | 11-21-1955 | Glasgow..... | 10-28-1955 |
| Edgecombe County..... | 10- 5-1956 | Livingston..... | 6- 8-1956 | Lexington..... | 10-28-1955 |
| Forsyth County..... | 2-22-1957 | Loudon..... | 5-24-1956 | Luray..... | 11-11-1955 |
| Guilford County..... | 9-26-1956 | Manchester..... | 10-12-1956 | Marion..... | 11-29-1956 |
| Halifax County..... | 2-16-1956 | Milan..... | 6-19-1956 | Norfolk..... | 6- 1-1956 |
| Jackson County..... | 12-12-1956 | Morristown..... | 8-20-1956 | Portsmouth..... | 3- 7-1957 |
| Lee County..... | 3- 7-1957 | Murfreesboro..... | 7-14-1955 | Pulaski..... | 8-17-1956 |
| Lenoir County..... | 2- 4-1957 | Nashville-Davidson | | Radford..... | 8-15-1956 |
| Macon County..... | 12-12-1956 | County..... | 10-27-1955 | Richmond..... | 4- 6-1956 |
| Montgomery County..... | 10-22-1956 | Newbern..... | 11-14-1956 | Roanoke..... | 6- 1-1956 |
| Nash County..... | 1-17-1957 | Paris..... | 11-17-1956 | South Boston..... | 4-13-1956 |
| New Hanover County..... | 5-24-1956 | Pulaski..... | 9- 1-1955 | Staunton..... | 7-10-1956 |
| Northampton County..... | 9- 6-1956 | Rogersville..... | 11- 7-1955 | Williamsburg..... | 10-25-1955 |
| Pasquotank County..... | 7- 5-1956 | Shelbyville..... | 5-17-1956 | <i>Washington</i> | |
| Perquimans County..... | 7- 5-1956 | Sparta..... | 5-16-1956 | Spokane..... | 10-24-1956 |
| Sampson County..... | 8-27-1956 | Springfield..... | 7-23-1955 | Whitman County..... | 11- 8-1956 |
| Scotland County..... | 5-30-1956 | Sweetwater..... | 11-27-1956 | <i>Wisconsin</i> | |
| Swain County..... | 12-12-1956 | Tulahoma..... | 10- 9-1956 | Appleton..... | 1-10-1957 |
| Tyrrell County..... | 8- 5-1955 | <i>Texas</i> | | Ashland..... | 10-10-1956 |
| Washington County..... | 8- 5-1955 | Burkburnett..... | 8-16-1955 | Baraboo..... | 10-18-1955 |
| Wilson County..... | 10-18-1955 | Cleburne..... | 3-13-1956 | Beaver Dam..... | 2- 6-1957 |
| <i>Oklahoma</i> | | Corpus Christi..... | 7-26-1955 | Beloit..... | 12-20-1955 |
| Ardmore..... | 4-13-1956 | Dallas..... | 10-19-1956 | Burlington..... | 10-24-1956 |
| Bartlesville..... | 2-26-1957 | Edinburg..... | 11-21-1955 | Delavan..... | 10-24-1956 |
| Guthrie..... | 5-22-1956 | El Paso..... | 10-25-1955 | Dodgeville..... | 5-21-1956 |
| Mangum..... | 10-27-1955 | Falfurrias..... | 6-22-1956 | Eau Claire..... | 2- 7-1957 |
| Okmulgee..... | 5- 8-1956 | Gladewater..... | 2-19-1957 | Elkhorn..... | 10-24-1956 |
| Sulphur..... | 2- 9-1956 | Harlingen..... | 6-14-1956 | Fontana..... | 10-24-1956 |
| Tahlequah..... | 5- 1-1956 | Houston..... | 5-24-1956 | Fort Atkinson..... | 10-24-1956 |
| Tulsa..... | 5-23-1956 | Jacksonville..... | 6- 7-1956 | Green Bay..... | 10- 6-1955 |
| <i>Tennessee</i> | | Kilgore..... | 2-19-1957 | Janesville..... | 11-23-1955 |
| Bristol..... | 11- 3-1955 | New Braunfels..... | 1-31-1957 | Kenosha..... | 7-14-1955 |
| Chattanooga..... | 11-20-1956 | Plainview..... | 6- 2-1956 | La Crosse..... | 1-29-1957 |
| Clinton..... | 5-29-1956 | San Benito..... | 6-14-1956 | Lake Geneva..... | 10-24-1956 |
| Columbia..... | 6- 7-1956 | Texarkana..... | 3- 9-1956 | Madison..... | 11-18-1955 |
| Cookeville..... | 9-21-1955 | Tyler..... | 3- 5-1957 | Manitowoc..... | 4-12-1957 |
| Dyersburg..... | 11-14-1956 | Vernon..... | 10-26-1955 | Milwaukee..... | 6- 8-1956 |
| Fayetteville..... | 6- 7-1956 | Wichita Falls..... | 2-19-1957 | Oshkosh..... | 7-11-1956 |
| Franklin..... | 5- 3-1956 | <i>Utah</i> | | Racine..... | 7-12-1956 |
| Greeneville..... | 6-19-1956 | Logan..... | 5- 4-1956 | Ripon..... | 2- 6-1957 |
| Humboldt..... | 6-19-1956 | Ogden..... | 10-18-1955 | Sheboygan..... | 7- 7-1955 |
| | | Salt Lake City..... | 2-10-1956 | Walworth..... | 10-24-1956 |
| | | | | Waupun..... | 2- 6-1957 |
| | | | | Williams Bay..... | 10-24-1956 |

Communities awarded milk sanitation ratings of 90 percent or more, July 1955-June 1957

100 PERCENT MARKET MILK PASTEURIZED

| <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> | <i>Community</i> | <i>Date of rating</i> |
|---------------------------------|-----------------------|--------------------------------------|-----------------------|---------------------------------------|-----------------------|
| <i>Arizona</i> | | <i>Indiana</i> | | <i>Kentucky—Con.</i> | |
| Graham County..... | 10-16-1956 | Berne, Bluffton, Warren area..... | 1-17-1957 | Owensboro..... | 5-17-1956 |
| Phoenix..... | 2-1957 | Brazil..... | 12-21-1955 | Paducah..... | 8-5-1955 |
| <i>Colorado</i> | | Elkhart, Goshen, Nap-panee area..... | 1-11-1956 | Paris-Bourbon County.. | 5-3-1956 |
| Boulder County..... | 12-14-1956 | Evansville..... | 12-20-1956 | Princeton..... | 2-21-1957 |
| Colorado Springs..... | 1-19-1956 | Greencastle..... | 1-4-1956 | Russellville..... | 11-7-1956 |
| Denver..... | 10-28-1955 | Indianapolis-Marion County..... | 8-13-1956 | Smithland..... | 6-6-1956 |
| Pueblo County..... | 2-2-1956 | Kokomo..... | 2-19-1957 | Spencer County..... | 6-1-1956 |
| <i>District of Columbia</i> | | Lafayette..... | 9-7-1956 | Stanford..... | 12-2-1955 |
| Washington..... | 3-12-1956 | La Porte..... | 5-25-1956 | Trigg County..... | 10-5-1956 |
| <i>Georgia</i> | | Madison..... | 8-1955 | Union County..... | 5-7-1956 |
| Albany..... | 5-24-1956 | Monticello..... | 12-6-1955 | <i>Mississippi</i> | |
| Athens-Clarke County.. | 4-2-1957 | Muncie..... | 11-30-1956 | Canton..... | 11-14-1956 |
| Atlanta..... | 10-28-1955 | Rochester..... | 12-19-1956 | Clarksdale..... | 1-9-1957 |
| Augusta-Richmond County..... | 11-9-1956 | Salem..... | 6-28-1956 | Columbus..... | 9-19-1956 |
| Bainbridge..... | 1-19-1956 | South Bend..... | 3-8-1956 | Eupora..... | 2-23-1956 |
| Baxley..... | 8-14-1956 | Warsaw..... | 11-16-1956 | Greenwood..... | 4-25-1956 |
| Calhoun, Gordon County..... | 9-7-1956 | <i>Kentucky</i> | | Grenada..... | 11-15-1955 |
| Camilla..... | 9-9-1955 | Anderson County..... | 5-17-1956 | Hernando..... | 1-7-1957 |
| Cartersville..... | 1-30-1957 | Barbourville..... | 11-28-1956 | Iuka..... | 7-19-1955 |
| Columbus..... | 1-18-1957 | Bardstown-Nelson County..... | 5-21-1957 | Kosciusko..... | 8-10-1955 |
| Dalton, Whitfield County..... | 9-9-1955 | Benton..... | 6-7-1956 | Laurel..... | 7-12-1956 |
| Douglas..... | 6-14-1956 | Bowling Green..... | 11-17-1955 | Louisville..... | 11-23-1956 |
| La Grange..... | 12-20-1956 | Brandenburg..... | 4-11-1957 | McComb..... | 8-2-1956 |
| Moultrie..... | 5-22-1957 | Breckenridge County.. | 5-31-1956 | Meadville..... | 3-7-1957 |
| Quitman..... | 5-8-1957 | Cadiz..... | 10-5-1956 | Meridian..... | 6-18-1956 |
| Savannah, Chatham County..... | 9-25-1956 | Campbellsville..... | 4-5-1957 | Morton..... | 7-24-1956 |
| Statesboro-Bulloch County..... | 3-27-1957 | Covington..... | 6-13-1957 | New Albany..... | 1-18-1956 |
| Valdosta..... | 4-18-1956 | Eddyville..... | 6-5-1956 | Oxford..... | 12-14-1955 |
| Waycross..... | 8-30-1956 | Falmouth..... | 4-26-1956 | Picayune..... | 11-4-1955 |
| <i>Idaho</i> | | Frankfort..... | 7-23-1955 | Starkville..... | 3-13-1957 |
| Idaho Falls..... | 6-13-1956 | Fulton..... | 12-23-1955 | State College..... | 3-13-1957 |
| <i>Illinois</i> | | Georgetown..... | 10-16-1956 | Tupelo..... | 4-9-1957 |
| Evanston..... | 3-13-1957 | Greenville..... | 6-6-1956 | <i>Missouri</i> | |
| North Shore municipalities..... | 3-20-1957 | Hardinsburg..... | 5-31-1956 | Cape Girardeau..... | 7-12-1956 |
| Glencoe..... | | Harrodsburg..... | 2-20-1957 | Chillicothe..... | 3-5-1957 |
| Highland Park..... | | Hodgensville..... | 2-14-1957 | Fulton..... | 3-7-1956 |
| Kenilworth..... | | Hopkinsville..... | 11-17-1955 | Kansas City..... | 8-17-1956 |
| Lake Bluff..... | | Lawrenceburg..... | 5-17-1956 | St. Louis..... | 11-28-1955 |
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| Northbrook..... | | Louisville-Jefferson County..... | 4-19-1956 | Springfield..... | 10-26-1956 |
| Wilmette..... | | Mayfield..... | 9-16-1955 | <i>Nevada</i> | |
| Winnetka..... | | Monticello..... | 7-20-1956 | Clark, Lincoln, and Nye Counties..... | 5-1-1957 |
| Oak Park..... | 3-6-1957 | Morgantown..... | 6-5-1956 | Yerington..... | 11-21-1955 |
| | | Murray..... | 3-16-1956 | <i>New Mexico</i> | |
| | | Newport-Campbell County..... | 10-20-1955 | Albuquerque..... | 10-26-1956 |
| | | | | Portales..... | 9-28-1956 |

Q Fever and Milk Pasteurization

A SIGNIFICANT number of human cases of Q fever have occurred in the United States in recent years. In certain Western and Southwestern States, the disease has been found to be endemic in cattle, goats, and sheep.

Contaminated milk from animals infected with *Coxiella burnetii*, the organism of Q fever, constitutes one method of introducing the organism into man's environment. Furthermore, early studies of Q fever in California had shown that *C. burnetii* survived the procedures recommended for the pasteurization of milk. Therefore, at the request of the director of the California State Department of Public Health, a cooperative study was organized to determine the times and temperatures required to eliminate viable rickettsiae from a community's milk supply.

The study was conducted in the department of public health, School of Veterinary Medicine, University of California. The Milk and Food Program and the Robert A. Taft Sanitary Engineering Center, both components of the Division of Sanitary Engineering Services, and the Communicable Disease Center were participating agencies of the Public Health Service, and the Dairy Industries Supply Association, Inc., and the Milk Industry Foundation also participated.

Thermal regression lines were constructed from the data obtained in the study and evaluated by statistical methods. For the regression line constructed from the minimum times at each temperature at which no surviving organisms could be demonstrated, a two-sigma or a 97.7 percent confidence interval was calculated. The addition of this confidence interval to the minimum time of destruction regression line was considered to represent an adequate margin of safety and the conclusions reached in the study are based on this method of treating the data.

It was concluded from the results of the study

that the minimum recommended standard for the pasteurization of milk of 143° F. for 30 minutes was inadequate to eliminate all the viable rickettsiae from cow's milk. However, heating the milk for 30 minutes at 145° F.



Public Health

MONOGRAPH

No. 47

The accompanying summary covers some of the principal findings presented in Public Health Monograph No. 47, published concurrently with this issue of Public Health Reports. The authors are with the department of public health, School of Veterinary Medicine, University of California, and the Robert A. Taft Sanitary Engineering Center, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of major universities and in selected public libraries.

• • •

Enright, Jahn B., Sodler, Walter W., and Thomas, Robert C.: Thermal inactivation of *Coxiella burnetii* and its relation to pasteurization of milk. Public Health Monograph No. 47 (PHS Publication No. 517). 30 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1957. Price 25 cents.

Communities awarded milk sanitation ratings of 90 percent or more, July 1955-June 1957—Con.
BOTH RAW AND PASTEURIZED MARKET MILK

| <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> | <i>Community and percent of milk pasteurized</i> | <i>Date of rating</i> |
|--|---------------------------|--|---------------------------|--|---------------------------|
| <i>Georgia</i> | | <i>North Carolina</i> | | <i>Texas</i> | |
| Marietta, 97.8..... | 10-26-1956 | Cleveland County, 89.9.. | 9-10-1956 | Austin, 99.4..... | 1-28-1957 |
| Newman, 95..... | 5- 3-1956 | <i>Oklahoma</i> | | Brenham, 94..... | 6-13-1956 |
| Pelham, 94..... | 9- 7-1955 | Elk City, 99..... | 4-30-1956 | Brownsville, 98.3..... | 6-28-1956 |
| Thomaston, 91.5..... | 5- 3-1956 | Henryetta, 80.7..... | 4-17-1956 | Fort Worth, 99.98..... | 2-29-1956 |
| Washington, 99.8..... | 3- 1-1957 | Lawton, 99.2..... | 12-20-1955 | Longview, 99..... | 2-20-1957 |
| Winder, 99..... | 3- 7-1957 | McAlester, 84..... | 7-18-1956 | Lubbock, 99.4..... | 6-14-1956 |
| <i>Idaho</i> | | Muskogee, 97.6..... | 12-15-1955 | Marshall, 98..... | 1- 4-1957 |
| Ada County, 96..... | 1-11-1957 | Norman, 99..... | 1-16-1956 | McAllen, 99.2..... | 11-21-1955 |
| <i>Kentucky</i> | | Oklahoma City, 98..... | 11- 9-1956 | Mercedes, 99..... | 11-21-1955 |
| Lexington-Fayette | | Ponca City, 96.6..... | 4-18-1956 | Paris, 99..... | 1-23-1957 |
| County, 99..... | 9-13-1956 | Shawnee, 98.8..... | 11-18-1955 | San Angelo, 99.7..... | 9- 1-1955 |
| Madisonville, 99..... | 1-25-1957 | <i>Oregon</i> | | Waco, 99.76..... | 3-19-1956 |
| Somerset, 95..... | 1-10-1957 | Portland, 99.4..... | 7-30-1955 | <i>Virginia</i> | |
| <i>Missouri</i> | | <i>Tennessee</i> | | Charlottesville, 99.4.... | 10-17-1955 |
| Joplin, 97..... | 12-13-1956 | Harriman, 96.2..... | 12- 7-1955 | <i>West Virginia</i> | |
| Poplar Bluff, 97.4..... | 8-18-1955 | Kingston, 87.1..... | 11-21-1955 | Kanawha County, 99.. | 11-20-1956 |
| | | McMinnville, 98.3..... | 5-15-1956 | | |

NOTE: In these communities the pasteurized market milk shows a 90 percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90 percent or more compli-

ance with the grade A raw milk requirements, of the milk ordinance suggested by the United States Public Health Service.

Note particularly the percentage of the milk pasteurized in the vari-

ous communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

Course in Laboratory Diagnosis of Tuberculosis

A course in laboratory methods in the diagnosis of tuberculosis will be offered January 20-31, 1958, by the Public Health Service under the joint sponsorship of the Division of Special Health Services and the Bacteriology Laboratory, Communicable Disease Center, Chamblee, Ga.

Eligible for the course are all grades of employed laboratory personnel who are approved by their State health officers. Personnel attending this course will be offered a student extension service for 1 year after the end of the course.

The course offers practical laboratory training in all phases of tuberculosis bacteriology, microscopy, cultural procedures, diagnostic use of animals, and testing of drug sensitivity.

No tuition or laboratory fees are charged. Reservations should be made well in advance. Information and application forms may be obtained from the Laboratory Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

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Continued ►



frontispiece

Anechoic chamber (interior structure) and library, in the new building for Pittsburgh's Graduate School of Public Health. (Dedication seminar on pages 1005-1008.)

would accomplish this. Results of the study strongly supported as adequate the minimum recommended standard for the pasteurization of milk at 161° F. for 15 seconds.

A study committee composed of representatives of the Public Health Service and of the milk industry recommended the minimum standards for pasteurization of milk be changed to conform with the findings of the study. The recommendations of this committee were disseminated to State and local milk control authorities and to the dairy industry.

The first part of the study was concerned with the investigation of two vitally important problems. The first was the determination of the maximum number of *C. burnetii* to be found in cow's milk in order to determine the concentration of organisms to be subjected to various temperature-time combinations. This was accomplished by testing milk from various areas of California, by testing the milk of individual cows in a herd in which the infection had existed for some time, by artificially inoculating a lactating dairy cow and testing her milk, and by determining the experience of other Q fever investigators in the United States. This type of field study encompassed many different kinds of husbandry, many different breeds of dairy cows, dairy herds of various epidemiological statuses, and individual

animals in different physiological conditions, especially in relation to parturition.

The second problem investigated early in the study was the determination of the best method of detecting the survival of small numbers of *C. burnetii* after the test population had been subjected to various conditions of time and temperature.

It was also determined that no demonstrable difference existed in the thermal resistance of *C. burnetii* when found in the milk of infected cows or when the organisms were grown in embryonating chicken eggs and then added to the milk of normal cows.

In the thermal resistance studies that followed, *C. burnetii* grown in embryonating chicken eggs were added to whole raw milk, adjusted to contain 3.8 percent butterfat, so that the test population of rickettsiae was of the same magnitude as that number found in 100,000 infectious guinea pig doses per milliliter. This test population was subjected to various combinations of time and temperature in both a laboratory study and a study using full-scale commercial pasteurization plant equipment. Tests to determine the presence or absence of surviving organisms consisted of examination of the serums of second-passage guinea pigs for the appearance of specific complement-fixing antibody.

First PHS Grant for Aging Research

An award of \$306,922 for research on aging has been granted by the Public Health Service to Duke University, Durham, N. C. The award, announced August 1, 1957, launched the Service's new program to stimulate the establishment of research centers in which university departments and local health and related agencies co-operate in the study of various aspects of aging.

Objectives of the Duke University program are to develop a center for aging research through universitywide effort; to support fundamental research on health problems of aging and to include research contributions from social and behavioral sciences and related fields; to train investigators for such research; and to foster a regional resource for the dissemination of scientific knowledge in the field of aging.

The program of the Public Health Service is under the Center for Research on Aging established in October 1956 at the National Institutes of Health.

Trends in Poultry Hygiene

JOE W. ATKINSON, D.V.M.

THE POULTRY INDUSTRY has doubled in size since 1940, to become the third largest source of farm income. Poultry products, including eggs, have reached an annual value of approximately \$4 billion at the producer level and \$6 billion at the retail level. This period of rapid expansion has been accompanied by the development of widely varied practices and conditions in the poultry processing and merchandising industry.

Supermarket display cases bulge with ready-to-cook, precooked, and frozen poultry products in appetizing array, protected by colorful, eye-catching containers and packaging materials. Most of these products have been processed in large volume by production-line methods, and many have been transported long distances. Conversely, there remain numerous small poultry plants where only fresh poultry is produced, processing is accomplished with a minimum of equipment, and sales are restricted to the immediate premises or locality; in some establishments, birds may be slaughtered 1 or 2 at a time after being selected live from the coop or battery by the consumer. Also, in certain areas of the country, uneviscerated, or so-called New York-dressed, poultry carcasses are still delivered to the restaurant and hotel trade for evisceration in the kitchen

and to retail markets for evisceration or for sale "as is" to the housewife.

In competition with the processing plant where the carcasses are eviscerated immediately after slaughter and removal of the feathers, and are promptly refrigerated under sanitary conditions, there is the plant where carcasses are thrown into tanks of water or ice slush and kept for evisceration later—a very insanitary and undesirable procedure. These carcasses may even be shipped to another plant or held in frozen storage for weeks or months before evisceration (1). In like manner, plants which operate at speeds and with procedures permitting sanitary conditions and prevention of undue contamination of product must compete with those which sacrifice sanitary considerations to the desire for speed and the highest volume possible at the lowest production cost. While some products are prepared under continuous official inspection, health, labor, and consumer groups have become increasingly concerned over the majority of plants and poultry products, which have not been subjected to such inspection.

From this many-sided picture, certain trends have emerged. These include improved sanitary procedures, improved methods of lengthening the time poultry can safely be stored, a decrease in the sale of uneviscerated poultry, increased production of ready-to-cook poultry, and an increase in official poultry regulation activities. It seems almost inevitable that these trends will continue and even accelerate in the next decade, to the benefit of all concerned. However, further study is needed of methods of determining the sanitary quality of

Dr. Atkinson is consultant, Poultry Inspection and Sanitation, Milk and Food Program, Division of Sanitary Engineering Services, Public Health Service. His paper is based on a talk he gave before the meeting of the Southern Branch, American Public Health Association, Asheville, N. C., May 31, 1957.

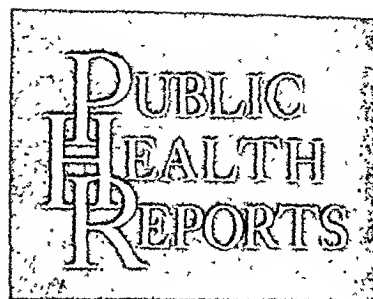
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reference to long-time trends.

Selwyn D. Collins

86 pages; illustrated. A summary and information on availability
appear on pages 1025-1026.



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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEROY E. BURNEY, *Surgeon General*

include scheduled collections of product samples from various points along the processing line. Laboratory examination of these samples complement general sanitation supervision by identifying potential trouble spots before they develop to serious proportions. The results of these research and quality control programs may well serve as a basis for official bacterial standards in years to come.

The trend toward better sanitary facilities and procedures in the poultry processing industry will undoubtedly continue. Poultry processors are learning that the phrase "sanitation pays" is more than just a trite saying—it is a statement of fact. This has been highlighted recently by studies on various methods of prolonging the storage life of fresh poultry.

Prolonging Storage Life

For some time, new ways have been sought to extend the storage life of fresh poultry. As might be expected, the first and most essential measure has proved to be the production of sanitary ready-to-cook poultry with an initial low bacterial count. Also, unless and until a practicable method of proved safety and acceptability is developed for sterilizing raw poultry, immediate and adequate refrigeration will remain essential to long storage life.

Low Holding Temperatures, Brine Immersion

More efficient refrigeration of poultry certainly contributes to prolonged storage life. A study by the State College of Washington indicated that holding ready-to-cook poultry, after initial chilling, at 31°–32° F. rather than at 38° F. was more effective than use of certain chemicals or biologicals in the chill water (4).

Faster chilling and freezing of poultry is possible through brine immersion techniques (5). In the September 1954 issue of *Marketing Activities*, a U. S. Department of Agriculture publication, Dr. Lyle L. Davis reported:

"This method of cooling eviscerated poultry has other advantages. Packaging the product prior to cooling and combining cooling and freezing operations in one step minimizes possible contamination of birds during handling; reduces overall handling and labor costs; eliminates leaching of flavor that may take place

during slush ice cooling; and provides a higher quality product with less shrinkage and better color and appearance."

Some plants utilize brine or propylene glycol immersion freezing after chilling of the unpackaged carcasses in slush ice. This would seem to nullify most of the advantages mentioned by Davis. It would also seem less desirable from the consumer viewpoint because of the considerable amount of water absorbed by the carcasses while in the slush ice, which contributes to an increased weight of product for freezing. However, there is some evidence that holding ready-to-cook turkeys for several hours in the chilled state before freezing results in a more tender product.

Antibiotics and Inplant Chlorination

Various adjuncts to refrigeration are being utilized in poultry processing. Oxytetracycline and chlortetracycline, products of two different manufacturers, have been approved by the Food and Drug Administration for use in poultry chill water, with a maximum allowable tolerance of 7 p.p.m. in the chilled raw poultry. These antibiotics can substantially extend the storage life of sanitary fresh poultry if the product is kept properly refrigerated (6).

Antibiotic treatment of poultry is no substitute for sanitation or refrigeration. It will not make a diseased or otherwise unfit bird suitable for human consumption, nor will it improve the sanitary quality of the product. The treatment temporarily inhibits bacterial growth when applied to a fresh, sanitary product, but it is relatively ineffective on an insanitary product or when applied after bacterial reproduction has been under way for a few days—it will not improve a spoiled or inferior product. Furthermore, refrigeration is still necessary to decrease the rate of microbial growth and other deteriorative changes.

At this time, one State (Colorado) has prohibited the sale of poultry treated with antibiotics as being in violation of the State law which provides that no preservative may be added to poultry. Also, the State of Massachusetts is not permitting the sale of antibiotic-treated poultry, pending a review and ruling on the matter by State authorities.

Inplant chlorination of the water used in

poultry and poultry products, the effectiveness of specific sanitary measures, and the environmental factors which contribute to injuries and infections and their prevention in the poultry processing industry.

Improved Sanitary Facilities and Procedures

Buildings, equipment, operating procedures, waste disposal facilities, and refrigeration practices are rapidly improving in the poultry processing industry. Even in many of the smaller plants, management is learning that good sanitation is good business. Buildings and equipment especially constructed, laid out, and located for poultry processing are much more efficient and economical in operation than are old, converted premises and makeshift, insanitary equipment and facilities. Products produced under sanitary conditions have good keeping quality and are easier to merchandise effectively and consistently. Sanitary surroundings contribute to employee morale and healthier working conditions, resulting in better work performance, less labor turnover, and less absenteeism because of illness (2).

It has been said that one of the tragedies of life is the murder of a beautiful theory by a gang of brutal facts (Franklin). A lot of theories on poultry processing and merchandising have been murdered by facts in recent years, and this is a trend which, we can be assured, will continue. However, it is definitely not a tragedy, because the facts have opened the way to more efficient, more sanitary, and more profitable operations.

For example, the Agricultural Marketing Service, U. S. Department of Agriculture, is cooperating in detailed studies on equipment and methods used in various stages of poultry processing. A study recently completed in Georgia on packing operations led to the development of new equipment and methods which can eliminate much of the handling and labor in the ice packing of fresh poultry and speed up and coordinate the work, thus saving money and time as well as reducing opportunity for contamination of the product. Undoubtedly, forthcoming studies in other operational areas will be equally productive.

The triumph of fact over theory is not new to

the poultry industry. A classic example is the theory of 20 years ago that poultry had to be merchandised uneviscerated, that is, as New York-dressed poultry, in order to ship it to large metropolitan markets and sell it before it spoiled. Another idea was that poultry could not be eviscerated commercially without contamination of the incised tissues and body cavity with fecal matter. These theories were thoroughly disproved long ago (3). As another example, many people believed that poultry had to be cut up on a wooden block, but the processing industry has long since learned that poultry carcasses can be suspended from a shackle or cut up on an impervious table or block in a manner which is just as fast and much more sanitary than the old "meatblock technique." Worth mentioning, also, is the action by U. S. Department of Agriculture inspectors encouraging removal of the liver, heart, and gizzard as the viscera hang still attached to the suspended carcass. This new procedure has accomplished its primary purpose of making possible more sanitary handling of the giblets and at the same time, has proved to be economic and practicable in both large and small plants.

Processing operations long thought to require hand labor are now performed wholly or in large part by specially designed equipment. Minimizing personal contact with the product usually can reduce chances for contamination. Thus, the foreseeable trend toward mechanizing of poultry should result in better sanitary quality of product. Unfortunately, mechanization of a particular process may not always produce happy results from a sanitary point of view; for example, present mechanized methods of defeathering poultry leave much to be desired, a situation which remains to be corrected by some future development.

Knowledge of microbiological facts pertinent to the processing of poultry products such as pies and stuffings can be used to maintain better control of refrigerating practices, ingredients, and processing operations, thereby routinely keeping bacterial counts down to levels thought impracticable of attainment a few years ago. These facts are being obtained by progressive processors through programs of research and quality control. These programs

result in death, permanent physical impairment, or loss of employment for a day or more. For example, if an employee contracts a skin rash but continues to work, the condition is not reported. Unfortunately, we do not have information on the frequency of specific infections or injuries, with the exception that several hundred cases of psittacosis have been reported as transmitted from poultry to man since 1948, with 137 known cases, including 4 deaths, occurring in 1956.

Injury frequency rate ¹ in selected industries

| Industry | 1955 | 1956 ² |
|---|-------|-------------------|
| Average for all manufacturing..... | 12. 1 | 11. 9 |
| Logging..... | 73. 5 | 69. 4 |
| Sawmills and planing mills..... | 41. 5 | 41. 3 |
| Poultry and small game: dressing and packing..... | 34. 3 | 36. 7 |
| Meatpacking and custom slaughtering..... | 18. 9 | 19. 1 |
| Sausage and other prepared meat products..... | 20. 2 | 24. 0 |
| Steel foundries..... | 19. 9 | 23. 8 |
| Construction and mining machinery..... | 16. 5 | 17. 8 |
| Blast furnaces and steel mills..... | 4. 8 | 4. 5 |

¹ Disabling injury or infection per 1 million man-hours worked resulting in absence from job of 1 day or more.

² Tentative.

SOURCE: Bureau of Labor Statistics Quarterly Report, June 19, 1957.

A comparison of the reported injury frequency rates of only a few industries indicates the need for studies that will more definitely delineate the problems and develop corrective measures in the poultry processing industry.

Foodborne Disease

The role of poultry in foodborne disease outbreaks is also worthy of consideration. Over 30 percent of the cases of foodborne disease reported by the States to the National Office of Vital Statistics are associated with poultry and poultry dishes. During the 10-year period, 1945-54, 31,832 of a total of 97,485 cases reported, or 32.6 percent (13), were attributed to the consumption of poultry; in 1955, 1,610 of 9,633 cases, or 16.7 percent; and in 1956, 3,994 of 11,133 cases, or 35.8 percent.

Domesticated poultry is a major natural reservoir of *Salmonella*. Numerous investigators have shown that poultry and poultry products

carry organisms of potential food poisoning types while in the poultry processing establishment and when shipped therefrom.

It must be emphasized, however, that the contamination of poultry and poultry products may originate apart from the poultry itself, as from careless or infected plant workers or kitchen personnel, rodents, insects, sewage, unsafe water, dust, or other sources found in insanitary environments or resulting from poor food preparation practices. Epidemiological investigations of foodborne outbreaks associated with poultry and poultry products frequently fail to disclose whether the contamination originated with the bird, the environment, or the food handler. Lack of proper refrigeration before or after preparation of the food often appears to be a contributing factor.

Although other classes of perishable foods may be exposed to similar hazards of mishandling during distribution or in the kitchen, they are not so frequently associated with foodborne outbreaks as are poultry and poultry products.

Research and Investigations Needed

In view of the above, it is evident that continuing epidemiological and public health field and laboratory investigations are needed to learn more about—

1. Microbiological and chemical procedures, and possibly standards, for laboratory and field use in determining the sanitary quality of poultry and poultry products.

2. The health and consumer significance of certain commercial practices, including new processing and merchandising techniques and product treatment procedures.

3. Practical sanitary measures for preventing contamination of poultry and poultry products during processing, and the relative effectiveness of these measures for reducing the incidence of foodborne disease outbreaks associated with poultry.

4. The environmental factors which contribute to the high injury frequency rate in the poultry processing industry, the specific infections and injuries occurring, and practical preventive measures.

Nevertheless, as has been done with respect to health and consumer problems in other food industries, official agencies, while continuing the

poultry processing operations at 10-20 p.p.m. has proved to be "an exceptionally effective, overall means for decreasing the bacterial counts. It lowered the counts on equipment and poultry carcasses, eliminated slime, corrosion, and plant odors, cleared corroded pipes and nozzles, and reduced cleanup time and labor by more than 33 percent" (7). If proper procedures are followed, inplant chlorination can be used in plants which also use the antibiotic treatment discussed above. In this regard, instructions to U. S. Department of Agriculture poultry inspection personnel (AMS PY-Instruction No. 918-10, Supplement No. 2, revised 2/13/57) on the use of antibiotics state: "When chlorinated water is used in the plant some of the poultry should be placed in the tank and should be in contact with the chlorinated water for at least 5 minutes before the stock solution of Acronize PD is added. This procedure is necessary to remove the chlorine from the water. However, this is not necessary when the antibiotic is compatible with chlorine as in the case of oxytetracycline."

Inplant chlorination extends storage life of the product by reducing initial bacterial load. It is comparatively economical and improves plant sanitation generally. Therefore, it is somewhat surprising that more processors have not taken advantage of it. This is a procedure which would be quite beneficial in both large and small plants, and it seems worthy of serious consideration as a required sanitary measure under official regulatory programs.

"New York-Dressed" on Way Out

The trend toward production of ready-to-cook poultry continues. It is estimated that only about 10 percent of poultry is now sold to the consumer in the New York-dressed, uneviscerated form. However, a substantial amount of slaughtered poultry, estimated as another 20 percent, is chilled, stored, shipped, or delivered to commercial establishments prior to actual evisceration. These practices are very objectionable from the health and sanitation viewpoint, and regulatory measures will undoubtedly be needed in some instances to completely correct this situation (1,8).

Problems and Needs

In spite of the significant advances discussed above, more information is needed for an intelligent and scientific approach to the health and consumer problems associated with the processing and consumption of poultry.

Diseased Poultry

At least 26 diseases of poultry are known to cause infection in man (9-12). Some occur infrequently, however, and do not seem to present a significant public health problem. Others are not recognized as hazards specific to plant employees or consumers; in this latter category are eastern and western equine encephalomyelitis and St. Louis encephalitis.

Birds are believed to be the most important vertebrate hosts for viruses of these three diseases. Natural outbreaks have been observed in songbirds, ring-necked pheasants, and pigeons. Domestic fowl may have specific antibodies for the viruses and, when experimentally inoculated, chickens may develop a viremia but show no signs of illness. However, although the possibility of direct transmission cannot be ruled out, investigations indicate that these types of encephalitis are transmitted to man through insect bites.

Of the other diseases common to poultry and man, only a few have been shown to be transmitted to man from poultry, for example, salmonellosis, Newcastle disease, and psittacosis, except in rare instances. Even when no health hazard is involved, however, the consumer does not want to buy or eat food derived from or contaminated by diseased poultry, and the plant employee does not want to handle or be exposed to diseased carcasses or obnoxious materials.

Employee Health Problems

Reports to the Bureau of Labor Statistics indicate that the injury frequency rate in the poultry and small game dressing and packing industry is exceeded among 135 manufacturing industries only by the rates for logging and for sawmills and planing mills and is significantly higher than that of the red meat packing industry. The "injury frequency rate" is the number of disabling "injuries," including infections, per million man-hours worked which

filmstrips as visual training aids for persons concerned with poultry inspection and sanitation (17). Limited research on poultry diseases transmissible to man has been conducted and participated in by the Service, particularly in connection with outbreaks of psittacosis among poultry plant workers in Texas and Oregon. The Public Health Service is providing partial financial support for research projects at the Iowa State College on the microbiology of poultry processing and of precooked frozen foods.

The Public Health Service is cooperating with the Colorado State Department of Agriculture and the Department of Health and Hospitals, City and County of Denver, in a poultry sanitation demonstration project. The purpose of the project is to study the application at the local level of the administrative and sanitation provisions of the model poultry ordinance developed by the Service. It is hoped that the experience and information gained will be helpful to other State and local agencies.

A substantial number of States and municipalities are conducting or initiating programs dealing with sanitation in the processing and distribution of poultry; several are expanding their activities to include inspection of the poultry for wholesomeness. The inspection services have been limited to voluntary programs except in California where, under the State mandatory program, actual inspection is conducted by licensed poultry plant owners or employees.

Mandatory Federal Inspection

Despite the efforts of States and municipalities, mandatory Federal inspection of poultry for wholesomeness and control of sanitation is needed in plants which process poultry for interstate commerce. The first decisive step toward such inspection was taken early in 1956, with the introduction of bills in Congress calling for a mandatory poultry inspection service to be administered by the Food and Drug Administration. Since that time, all groups concerned have testified to the need for such an inspection service, and many have advised that it be administered by the U. S. Department of Agriculture.

Five hearings have been held before congressional committees, and as a result Public Law 85-172 has been enacted by Congress.

This law provides for compulsory inspection by the U. S. Department of Agriculture of poultry and poultry products processed in plants engaging in interstate and foreign commerce. It also provides authority for the Secretary of Agriculture, under certain conditions, to conduct public hearings and to designate areas of intrastate commerce to be subject to the provisions of Federal law.

State and Local Programs

Will a mandatory Federal poultry inspection program eliminate the need for State and local controls? Certainly it will make the problem much smaller. Just as certainly there will be a definite need for official regulation by the States or municipalities of processing plants which do not operate under the Federal inspection system, and of poultry and poultry products in wholesale and retail channels outside the processing plants (8).

More than twice as many poultry processing plants ship products only intrastate as engage in interstate commerce. A substantial quantity of poultry is processed in these plants. Official regulation by States and municipalities will be needed not only to provide protection of health and consumer interests in connection with the poultry normally processed in plants which ship only intrastate, but also because with an effective Federal poultry inspection program and concurrent absence of such a program at State and local levels, such plants might become a "dumping ground" for diseased, unfit poultry.

Presumably the Food and Drug Administration will continue its activity of checking on poultry or poultry products which have entered interstate commerce, particularly when contamination or decomposition is suspected. However, approximately 50 percent of poultry moves only intrastate, and even if it has been inspected at the time of processing, after it has left the processing plant it remains a problem for State and local agencies.

Furthermore, when disease breaks out among poultry plant employees or when foodborne disease is reported, State or local officials will still have the responsibility for making investigations and taking action to prevent repetition of these outbreaks.

search for new knowledge, must act on the basis of information currently available in establishing poultry inspection and sanitation safeguards.

Official Inspection and Supervision

Interested groups agree on the need for inspection of poultry for wholesomeness and sanitary supervision of poultry processing. In fact, the trend toward official poultry regulatory activities has recently accelerated to the extent that official inspection services will probably be provided to a major portion of the poultry processing industry within the next few years. These regulatory programs will not prevent all foodborne outbreaks associated with poultry or all illness among poultry plant employees. However, very definite benefits can be derived from such programs.

Control of sanitary factors in the processing and distribution of poultry (14), and proper antemortem and postmortem inspection of poultry for wholesomeness (15) can—

1. Remove from food channels poultry determined to be diseased or otherwise unfit for consumption.

2. Prevent, insofar as possible, contamination of the carcasses of healthy poultry during processing by disease matter and organisms from sick birds or by fecal matter and other wastes.

3. Within the framework of current knowledge, assure sanitary conditions and proper refrigeration within the processing establishment, proper packaging and labeling of product, and protection of product from contamination or spoilage while in distribution channels.

4. Minimize the exposure of employees to diseased poultry carcasses and wastes and exudates therefrom, and assure sanitary working conditions in clean, well-lighted, and well-ventilated surroundings.

5. Contribute to early detection of diseased poultry flocks and to the institution of treatment, segregation, vaccination, or other disease control measures, as well as to research and field investigations where indicated.

Official Services

For almost 30 years, the U. S. Department of Agriculture has provided a poultry inspection

service to be used voluntarily by processors with the costs borne by them. Over 300 plants now operate wholly or partly under the department's inspection, and it is estimated that about 30 percent of poultry sold off farms was thus inspected in 1956. Over 1.4 billion pounds of ready-to-cook poultry were certified for wholesomeness. Rejected were 2,888,417 poultry carcasses, weighing 11,270,951 pounds.

The U. S. Department of Agriculture poultry inspection service has done much to improve sanitation and operational procedures in the poultry industry and to set the stage for further progress. The need of the Armed Forces for substantial amounts of inspected poultry has been a major factor in the growth of the inspection program. Firms voluntarily operating under and financing this program have also contributed toward the improvements and the progress which have resulted.

The Food and Drug Administration helps assure the wholesomeness of poultry products shipped interstate by inspecting processing plants to uncover practices which may result in shipment of adulterated poultry and by examining poultry in wholesale and retail markets.

The Food and Drug Administration recently distributed to State and local officials a Manual for the Examination and Evaluation of Poultry and Poultry Products for Compliance with the Federal Food, Drug, and Cosmetic Act (15). Developed jointly by the Food and Drug Administration and the Public Health Service, the manual deals with antemortem and postmortem inspection of poultry and contains recommendations on the disposition of poultry affected by various diseases and other conditions. It is expected that the manual will be given more general distribution after receipt of comments from State and local agencies.

In 1955, the Public Health Service published a recommended poultry sanitation ordinance (14) for voluntary use by interested State and local agencies. This ordinance was developed with the cooperation and advice of the poultry industry, professional organizations, and interested Federal, State, and local agencies (13, 16). In addition, the Public Health Service has developed a motion picture and several

A study in 1956 reflects the wide variation in the legislative, organizational, fiscal, and operational aspects of local air pollution control activities, a situation to be expected at this time in view of variations in severity of air pollution and in degrees of public support given to its palliation.

Administration of Air Pollution Control in the United States

P. W. PURDOM, M.S.E.

BIOLOGICAL effects of polluted air and techniques of controlling atmospheric contaminants have been studied frequently and reported regularly. Few investigations have been made, however, of the administration of air pollution control programs. Yet administration provides the machinery necessary for transforming technical knowledge into positive action to enhance the urban atmosphere.

This paper analyzes information obtained in a survey of administrative characteristics of local air pollution control agencies in the spring of 1956. Since the study deals with practice, the data do not necessarily reflect ideal situations. Furthermore, air pollution problems vary with the peculiarities of the individual community, and the extent of the control program will vary according to the local needs. Keeping in mind these two considerations, administrators of air sanitation activities may find the data instructive.

Mr. Purdom is director of the division of air pollution control and environmental sanitation, Department of Public Health, Philadelphia, Pa. He prepared this paper from a much more detailed report of the study which he had presented at the annual meeting of the Conference of Municipal Public Health Engineers, Atlantic City, N. J., November 14, 1956.

From various sources, a list of 144 pollution control agencies was prepared, and a questionnaire was sent to each. Ninety-three agencies (65 percent) responded, 82 of which claimed active programs. The population served by the agencies ranged from 10,000 to 8,000,000. All of the communities with populations of 1,000,000 and over replied; however, below 50,000 population, there was only a 37.5 percent response.

Background Data

The questionnaire asked, among other things, for data on the industrial and commercial nature of the community and on the quantity of various fuels consumed. It was anticipated that such information might be indicative of the need for various types of control. Response was disappointing. The number reporting was so small that the data were not considered worthy of presentation. This suggests that communities do not have information that would be of value in determining the type of program needed in the community. It should be recognized, however, that under severe conditions organoleptic responses of individuals are sufficient to motivate control of air pollution.

To provide needed background, the agencies were asked to enumerate the major sources of air pollution in the area. Their answers, tabu-

Summary

Although the rapid expansion of the poultry industry has resulted in extreme contrasts in poultry processing methods, certain trends in poultry hygiene are evident.

Improved sanitary facilities, equipment, refrigeration methods, and operating procedures are being developed. New means for prolonging the storage life of poultry products are being utilized, and others are being tested. The sale of New York-dressed (uneviscerated) poultry is decreasing and the production of ready-to-cook poultry is increasing. Underway are studies designed to further the improvements in sanitary practice and operational procedures which have already contributed to more efficient and profitable industry operations. Official regulatory programs by Federal, State, and local authorities are increasing.

Research and investigations on public health and employee health problems associated with poultry and poultry processing are still needed. Nevertheless, information now available can be used to the benefit of all concerned with the further expansion of official poultry sanitation and inspection services at the Federal, State, and local levels.

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Table 2. Number of full-time professional and technical employees per 100,000 population served, according to range of per capita expenditures, air pollution control survey, 1956

| Per capita expenditure | Number agencies in range | Number full-time professional and technical employees per 100,000 population served ¹ | | | |
|----------------------------------|--------------------------|--|---------|--------|---------|
| | | Minimum | Maximum | Median | Average |
| \$0.000-\$0.049..... | 5 | 0.13 | 0.88 | 0.23 | 0.36 |
| \$0.050-\$0.099..... | 17 | .51 | 1.75 | 1.00 | 1.03 |
| \$0.100-\$0.149..... | 11 | 1.08 | 2.44 | 1.82 | 1.77 |
| \$0.150-\$0.199..... | 3 | 2.16 | 2.67 | 2.50 | 2.44 |
| \$0.200-\$0.299..... | 1 | 3.17 | 3.17 | 3.17 | 3.17 |
| \$0.300 and over..... | 2 | 3.33 | 4.18 | 3.76 | 3.76 |
| All reporting ² | 39 | .13 | 4.18 | 1.38 | 1.46 |

¹ Includes inspectors.

² Characteristics of this group are: range, \$0.020 to \$0.529; median, \$0.091; average, \$0.109.

The health department seems to have a slight edge over any other department as the agency responsible for air sanitation. Possibly this is due to development of air pollution control as an expansion of interest in industrial hygiene and inplant exposures to toxic substances. Also, this arrangement permits combining the chemical laboratories serving industrial hygiene and air pollution control. Certainly there is great need for coordination between industrial and air sanitation, and also between these and stream sanitation, to prevent the activities of one from causing changes that create problems for the others.

In the three instances where responsibility for air sanitation was shared by two departments, the health department was concerned primarily with odors and gases and another department was responsible for smoke abatement. This would appear to be an unsatisfactory arrangement. It does not readily permit a unified approach. In addition, there are the usual possibilities of costly duplication of effort and facilities or confusion resulting in no action on problems assumed by one agency to be within the province of the other.

Budget

Quality and quantity of work that an agency can perform are probably more dependent on its budget than on any other single factor. In this study, the annual per capita expenditure was the basis for comparison. Forty-six agencies reported data which could be used,

including seven for which the budget was estimated from personnel salary data. The number is rather disappointing as it represents only 56 percent of the 82 jurisdictions reporting active programs. In many instances where air pollution control was an activity in a larger department, it was stated that the budget was not kept separately. Even in such situations, it seems that it would be essential to proper management to know approximately the portion of the budget used for the air sanitation program.

Expenditures varied from 1 cent to 53 cents per capita, with a median of 8 cents. For agencies in health and building departments, the median budget was about 5 cents per capita. For those in other departments and for independent agencies, the median cost varied from 9 to 11 cents per capita.

No correlation between population served and per capita expenditures was observed. Per capita costs were related to the number of personnel provided per 100,000 population (table 2). Furthermore, a comparison of budget data for 1952 with 1956 data showed that cost changes were not related to population changes but that they were related to differences in the number of personnel.

Information was obtained and analyzed concerning salaries paid various categories of full-time technical and professional personnel (table 3). Salaries paid technically trained personnel exceeded those of other employees. No comparison was made with compensation in

lated below, reflect local opinion concerning the most serious sources in that area. They do not necessarily provide an all-inclusive list of sources of air pollution. If an industrial operation did not exist in a community, it obviously would not be a problem.

| Source | Number times reported |
|--|--------------------------|
| Open burning (refuse, scrap, industrial wastes)--- | 18 |
| Metal smelting and refining----- | 14 |
| Gasoline and diesel motive equipment (autos, trucks, locomotives)----- | 12 |
| Chemical industries (not specified)----- | 9 |
| Lumber, furniture, and so forth----- | 9 |
| Industrial (not specified)----- | 8 |
| Incinerators (domestic, apartment, commercial)--- | 8 |
| Oil refining----- | 5 |
| Railroad locomotives (coal burning)----- | 5 |
| Sulfur and sulfuric acid----- | 4 |
| Asphalt plants----- | 4 |
| Meat packing and rendering plants----- | 4 |
| Paint manufacturing----- | 4 |
| Fertilizer plants----- | 3 |
| Textiles----- | 3 |
| Laundries----- | 3 |
| Aggregates----- | 3 |
| Cement manufacturing----- | 3 |
| Farm products processing----- | 3 |
| Apartments, hotels, schools, substandard dwell- ings----- | 3 |
| Paper and pulp----- | 2 |
| Paint spray booths----- | 2 |
| Other (ammonia, rubber, lithographing, pollen, gas plant, food processing, milling, roofing, burning natural gas)----- | 9 |

Open burning was the most frequently cited major source of air pollution. This is a deplorable situation since sanitary methods of

refuse disposal which obviate any need for burning in the open are readily available and economically feasible for all communities.

Laws regulating air pollution and standards for compliance are usually adopted locally. Communities of 1,000,000 or more population frequently use board regulations to establish standards. Most of the communities in this study had laws controlling smoke, fly ash, odors, toxic gases, and nuisances, with no apparent trend due to population size. This finding indicates a tendency for communities to recognize air pollution problems through legislation, but not necessarily through support of program budget.

Administrative Status

There were no independent air pollution control agencies in the smallest population groups, but more than 50 percent in the largest group were independent (table 1). This is logical. In small areas, the workload may not be heavy enough to justify full-time employees, and administrative overhead costs of an independent agency may be prohibitive. In large areas, an independent agency may be justified on the ground that it lends greater emphasis to the air sanitation program. However, the fact that, even in the large population groups, independent status is not universal indicates that there may be advantages to conducting the activities as part of a larger administrative structure if administrative costs can be reduced without sacrificing emphasis.

Table 1. Administrative status of air pollution control, by population group, air pollution control survey, 1956

| Population group | Num- ber report- ing | Inde- pend- ent | Build- ing de- part- ment | Health depart- ment | Safety depart- ment | Other | Split |
|-------------------------|-------------------------------|-----------------------|------------------------------------|---------------------------|---------------------------|-------|-------|
| Under 50,000----- | 11 | 0 | 5 | 3 | 1 | 2 | 0 |
| 50,000-99,000----- | 11 | 2 | 2 | 3 | 2 | 2 | 0 |
| 100,000-199,000----- | 18 | 3 | 5 | 4 | 3 | 2 | 1 |
| 200,000-499,000----- | 18 | 4 | 4 | 6 | 1 | 3 | 0 |
| 500,000-999,000----- | 15 | 2 | 2 | 4 | 3 | 2 | 2 |
| 1,000,000 and over----- | 9 | 5 | 1 | 3 | 0 | 0 | 0 |
| Total----- | 82 | 16 | 19 | 23 | 10 | 11 | 3 |
| Percent----- | 100 | 19.5 | 23.2 | 28.0 | 12.2 | 13.4 | 3.7 |

¹ Split between health and building.

² 1 split between health and safety and 1 between health and public works.

provide the barest of service for a balanced program required at least 5 cents per capita. To provide minimally adequate services and personnel seemed to necessitate from 10 to 15 cents. For more complete services 15 cents or more per capita would be needed, depending upon the local problem and emphasis demanded.

Most of the agencies reported that detection and determination of air pollution violations result mainly from visual and olfactory observations. Frequently, these observations are supplemented by simple test equipment, such as a smokescope. This would indicate that small communities can readily engage in air pollution control programs without maintaining extensive laboratory facilities or equipment, particularly if technical assistance is available from the State health department.

One-third of the agencies reported no laboratory services available. Another one-third reported that State laboratories or commercial or institutional laboratories were used when needed. The remaining one-third reported that laboratory services of various types were part of the local program.

A thoughtful investigator might assume that techniques for achieving community participation in the air sanitation program would receive primary attention. The survey results

were therefore quite surprising. Only about one-tenth of the agencies reported any continuing industry or citizens committee to advise the control officials on matters of general interest. In fact, about one-third of the departments reported little or no community participation. Four agencies stated that their only contact was through complaints, and it appeared in at least one instance that even this contact was resented by the control agency. It is suggested that in most communities there are many people and many groups of people who can, and will if asked, contribute to an air sanitation program. With so few employees in most agencies, it is amazing that this method of multiplying effort has not been utilized more fully.

Conclusion

This paper is by no means exhaustive; rather it is suggestive of areas of administration of air pollution control programs worthy of further investigation. While much has been written concerning technical progress, little attention has been given to the administrative mechanisms necessary to use the technical knowledge effectively. To achieve the objective of clean air, administrative practice must keep pace with technical advances.

National Advisory Committee

A National Advisory Committee on Chronic Illness and Health of the Aged has been formed by Surgeon General Leroy E. Burney to advise on Public Health Service policy and programs for the complex medical, social, and economic problems associated with chronic illness and aging.

The 13-member committee met for the first time in Washington, D. C., October 17-18, 1957. Members are:

Dr. Robert Dyer, chief, division of preventive medical services, California State Department of Health, Berkeley; Dr. Michael N. Dacso, director, department of physical medicine and rehabilitation, Goldwater Memorial Hospital, New York City; Dr. Kieffer D. Davis, medical director, Phillips Petroleum Company,

Bartlesville, Okla.; Dr. Wilbert C. Davison, dean and professor of pediatrics, Duke University School of Medicine, Durham, N. C.

Dr. Ralph E. Dwork, director, Ohio State Department of Health; Dr. Henry B. Mulholland, assistant dean, University of Virginia Medical School, Charlottesville, Va.; Dr. Herbert K. Cooper, Lancaster (Pa.) Cleft Palate Center; Miss Emilie G. Sargent, executive director, Visiting Nurse Association, Detroit, Mich.

Commissioner John W. Tramburg, New Jersey State Department of Institutes and Agencies; William L. Rutherford, Forest Park Foundation, Peoria, Ill.; Dr. Cecil G. Sheps, executive director, Beth Israel Hospital, Boston, Mass.; Miss Helen M. Lipscomb, executive director, Chronic Illness Service Center, San Francisco; and Ben Grossman, director, Drexel Home, Chicago.

Table 3. Salaries paid personnel other than head of air pollution control agencies, air pollution control survey, 1956

| Personnel classification | Number agencies reporting | Lowest grade—minimum salary ¹ | | | Highest grade—maximum salary ¹ | | |
|----------------------------|---------------------------|--|---------|---------|---|---------|----------|
| | | Lowest | Median | Highest | Lowest | Median | Highest |
| Engineers..... | 13 | \$4,200 | \$5,280 | \$6,950 | \$4,200 | \$7,430 | \$12,000 |
| Chemists..... | 9 | 4,104 | 5,000 | 6,192 | 4,992 | 6,149 | 11,100 |
| Inspectors..... | 25 | 2,980 | 4,000 | 5,743 | 3,582 | 4,500 | 6,900 |
| Laboratory assistants..... | 4 | 2,750 | 3,075 | 3,600 | 3,600 | 3,667 | 3,925 |
| Supervising inspector..... | 7 | 3,770 | 5,647 | 6,900 | 4,576 | 6,198 | 9,564 |

¹ When a fixed salary for a grade was reported, the single salary was used in both maximum and minimum calculations.

other fields of employment, but salaries of scientific personnel were generally below national averages. Surprisingly, the director's compensation did not appear to be related to the budget of the agency or the number of personnel supervised, but it varied with population served and education required. College training was required in 25 of 31 communities with more than 100,000 population. It was not required, however, in 7 of 8 communities smaller than 100,000.

It should be emphasized here that numbers of personnel employed were not related to area of the community or population served. Commercial and industrial characteristics of the

communities were not described sufficiently to test for a correlation with such factors.

With respect to engineering personnel in particular, it was noted that there was little opportunity for a college graduate to begin employment directly upon graduation and make a career in an air pollution control agency. Most of the agencies required experience for all engineering positions.

Type of Services

More comprehensive services were generally provided for the communities with larger populations (table 4). The data indicated that to

Table 4. Percentage of agencies with specified services, by population group, air pollution control survey, 1956

| Type of service | Population group | | | | | | |
|---|---------------------|----------------------|------------------------|------------------------|------------------------|--------------------------|----------------------|
| | Under 50,000 (N=10) | 50,000-99,000 (N=10) | 100,000-199,000 (N=14) | 200,000-499,000 (N=14) | 500,000-999,000 (N=13) | 1,000,000 and over (N=8) | All reporting (N=69) |
| Complaint investigation..... | 90 | 100 | 100 | 100 | 92 | 100 | 98 |
| Violation detection..... | 100 | 50 | 93 | 79 | 92 | 100 | 90 |
| Operation and maintenance surveys..... | 70 | 30 | 29 | 64 | 62 | 100 | 57 |
| Plan review..... | 30 | 30 | 21 | 71 | 77 | 75 | 52 |
| Installation permits..... | 50 | 40 | 71 | 57 | 77 | 75 | 62 |
| License, equipment installers..... | 10 | 20 | 29 | 36 | 23 | 0 | 22 |
| License, equipment operators..... | 0 | 10 | 0 | 14 | 23 | 0 | 8 |
| License, plants..... | 10 | 0 | 7 | 7 | 31 | 25 | 13 |
| Plant air pollution source surveys..... | 40 | 30 | 29 | 50 | 62 | 88 | 48 |
| Area air pollution source surveys..... | 30 | 30 | 29 | 57 | 46 | 88 | 45 |
| Vegetative surveys..... | 10 | 10 | 21 | 7 | 0 | 25 | 12 |
| Laboratory services..... | 20 | 10 | 14 | 36 | 15 | 88 | 28 |
| Stack sampling..... | 20 | 20 | 14 | 14 | 47 | 75 | 29 |
| Air sampling: | | | | | | | |
| Particulates..... | 20 | 40 | 29 | 57 | 62 | 88 | 48 |
| Gases..... | 0 | 20 | 7 | 36 | 62 | 75 | 32 |
| Weather..... | 0 | 20 | 7 | 14 | 47 | 50 | 22 |
| Other service..... | 0 | 0 | 21 | 14 | 31 | 63 | 20 |

Estimate of Tuberculosis Prevalence in the United States, 1956

STANLEY GLASER, DONALD A. TRAUGER, and
ARTHUR H. WYMAN

THE PREVALENCE of tuberculosis is the total number of cases on any one day. At the beginning of 1956, there were an estimated 250,000 active cases of tuberculosis in the continental United States. Of this number, 150,000, or 60 percent, were known to State and local health departments. The rest of the estimated number comprised unknown cases, that is, currently unreported cases and a small number previously reported but since lost to supervision (table 1).

The estimates show that there also were 550,000 inactive cases. Of these, 250,000 were known to the health departments. The total number of active and inactive cases was estimated at 800,000.

In addition, there were an estimated 1,200,000 persons who once had tuberculosis but who do not now require supervision according to State and local health department standards. Although these persons do not now require public health supervision, they constitute a reservoir of potential cases susceptible to reactivation.

Change From 1952

The last estimates of prevalence of tuberculosis in the United States were made in 1952 (1). Because subsequent data indicated that

the figures for 1952 had been overstated, it was necessary to adjust some of the 1952 estimates downward. Both original and adjusted figures are shown in table 2. In calculating the percent change between 1952 and 1956, the adjusted estimates were used.

In 1956, the estimated total number of active cases shows a drop of about 30 percent from 350,000 in 1952; the known cases in this category decreasing by 20 percent, and the number of unknown cases by 35 percent.

In 1952, the total of estimated inactive cases was 600,000. This number had decreased to 550,000 by 1956, a change of nearly 10 percent. While the figure for the known inactive cases remained at 250,000, the estimated number of unknown inactive cases dropped from 350,000 to 300,000.

Although there has been a sizable decline in active tuberculosis cases in the United States, and a small decline in the inactive cases, the number of persons who once had active tuberculosis shows a 15 percent increase, from 1,050,000 in 1952 to 1,200,000 in 1956. The total number of cases of tuberculosis plus the persons who once had the disease has apparently remained at about 2,000,000.

Active cases are declining more rapidly than inactive cases, and unknown active cases, those not known to the health departments, are declining most rapidly.

The proportion of active cases hospitalized is increasing. Of the active cases known to health departments in 1952, 55 percent were hospitalized. In 1956, 60 percent were hospitalized (fig. 1).

Mr. Glaser serves as chief statistician, and Mr. Wyman, statistician, with the Program Services Section, Tuberculosis Program, Division of Special Health Services, Public Health Service. Mr. Trauger is director of the social research division, National Tuberculosis Association.

Assistance for Dental Diagnostic and Treatment Facilities

FEDERAL assistance to communities for the construction of dental facilities for the diagnosis and treatment of ambulatory and dental patients through the provision of the Hospital Survey and Construction Program, popularly known as the Hill-Burton Program, has stimulated interest in the development of these facilities.

Under this program more than 3,000 communities have received aid for the construction and equipment of hospitals and health centers. Since the act was amended in 1954, many other communities have applied for assistance in building and equipping nursing homes, chronic disease hospitals, rehabilitation centers, and diagnostic and treatment facilities for ambulatory patients, including patients in need of dental care.

Assistance is provided through allotment of Federal funds to States for grants to local facilities on a matching basis. Construction includes new buildings, expansion, remodeling and alteration of existing buildings, and initial essential equipment, as well as architects' and consultants' fees, site survey, and soil investigation.

A diagnostic and treatment center, as defined in the act, is "A facility providing community service for the diagnosis or diagnosis and treatment of ambulatory patients, which is operated in connection with a hospital, or in which patient care is under the professional supervision of persons licensed to practice medicine or surgery in the State, or, in the case of dental diagnosis or treatment, under the professional supervision of persons licensed to practice dentistry in the State."

This report was prepared by the Division of Hospital and Medical Facilities, Bureau of Medical Services, Public Health Service.

Dental facilities may be constructed under the 1954 amendments with priority determined by specific need for dental or medical diagnostic and treatment facilities, but the project for dental facilities per se must be definable as a project in area and service.

The minimum State allotment is \$100,000 for diagnostic and treatment facilities. Allotments are dependent on (a) size of appropriation, (b) the population of the State, and (c) the per capita income of the State. The allotment increases with population but decreases as per capita income rises.

The rate of Federal participation in projects is established by the State administering agency in accordance with principles set forth in the act. In no case, however, may the Federal share be less than 33 $\frac{1}{3}$ percent or greater than 66 $\frac{2}{3}$ percent.

An applicant for funds for diagnostic and treatment centers must be either a State, political subdivision, or public agency, or a corporation or an association which owns and operates a nonprofit hospital.

The State agency administering the Hospital and Medical Facilities Survey and Construction Program approves projects eligible under the act in conformance with a State plan and forwards State-approved projects to the Public Health Service for final approval. An applicant should contact the State administering agency to determine the availability of funds and the priority position of the project contemplated.

In all States and Territories but eight, the department or board of health is the designated agency. For these eight, the agency is—

Florida State Development Commission, Tallahassee.
Louisiana State Department of Hospitals, Baton Rouge.

Michigan Office of Hospital Survey and Construction, Lansing.

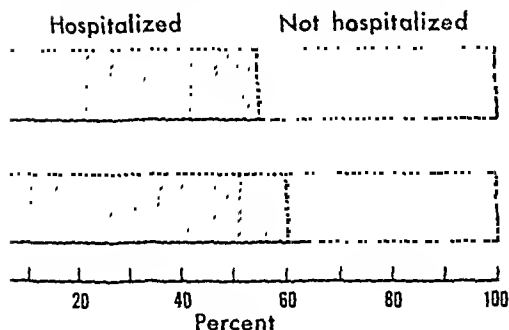
Mississippi Commission on Hospital Care, Jackson.
New Jersey State Department of Institutions and Agencies, Trenton.

New York Joint Hospital Survey and Planning Commission, Albany.

North Carolina State Medical Care Commission, Raleigh.

Pennsylvania State Department of Welfare, Harrisburg.

1. Hospitalization status of known active cases, 1952 and 1956



s); (b) clinically active cases in mental enal institutions; and (c) all cases clinically active at home and known to health tments.

sources of the data for known cases were: he Public Health Service tuberculosis bed s of April 1, 1956, giving the number of ulosis beds occupied in all Federal and 'ederal hospitals, except mental and penal ations, having facilities for treating tuber- s.

he Tuberculosis Hospital and Sanatorium tory published in 1954 by the National culosis Association showing the number erculosis beds in mental and penal institu- in 1953.

annual tuberculosis reports prepared by health departments and submitted to the ic Health Service, showing the number es hospitalized and active cases at home.

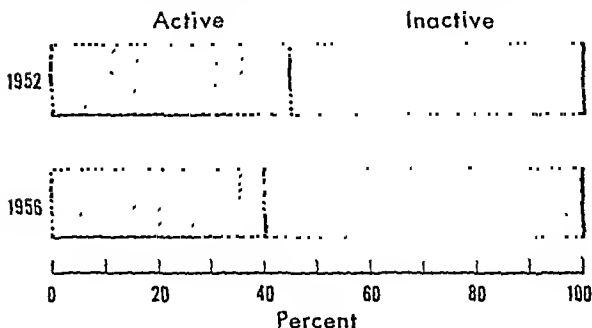
tuberculosis case register summary reports ved by the Public Health Service from and local health departments, showing known to health departments (2).

The nationwide nonhospitalized tubercu- patient study conducted by the Tubercu- Program of the Public Health Service in and 1955 (3, 4).

Additional supplementary data, such as ished reports of health departments.

ie tuberculosis bed census includes data on ublicerculosis beds in the Nation, except those mental and penal institutions. The 80,000 ublicerculosis beds occupied as reported by the census may be taken as the total number cases in all hospitals except mental and al institutions. These data were substan-

Figure 2. Clinical status of all cases known to health departments, 1952 and 1956



tiated by other sources, including the Public Health Service annual tuberculosis reports. The number of tuberculosis beds in mental and penal institutions, shown in the National Tuberculosis Association Hospital and Sanatorium Directory for 1953, was 20,000. On the basis of information available, about 10,000 of these beds were estimated to be occupied by clinically active cases, raising the total active cases hospitalized to 90,000.

The estimate of known active cases at home was based on several sources which complement each other. Public Health Service annual tuberculosis reports from about three-quarters of the States provide material for apparently reliable estimates. The figures from these reports were substantiated by data from case register summary reports and other similar sources of information. The State reports were the source of about 70 percent of the new clinically active cases reported in 1954 and 1955, and about 73 percent of the deaths. The total active cases at home for the continental United States was obtained by projecting the total for the reporting States to a total for the United States. The basis for the projection was the assumption that the ratio of known active cases at home in these States to the national total of known active cases at home would be the same as the ratio of the new active cases reported in these States to the total reported for the United States.

The resulting estimate was adjusted for overstatement on the basis of the experience of case review in the nonhospitalized tuberculosis patient study. From 35 to 40 percent of the cases originally listed as active and at home

Although active cases are becoming inactive at a more rapid rate than in the past, an increasing proportion of the patients remain on drug

Table 1. Number and rate of tuberculosis cases and persons who once had tuberculosis, 1956¹

| Category | Number | Rate per 100,000 population ² |
|---|-----------|--|
| Total cases..... | 800,000 | 480 |
| Known..... | 400,000 | 240 |
| Unknown..... | 400,000 | 240 |
| Active cases..... | 250,000 | 150 |
| Known..... | 150,000 | 90 |
| Unknown..... | 100,000 | 60 |
| Inactive cases..... | 550,000 | 330 |
| Known..... | 250,000 | 150 |
| Unknown..... | 300,000 | 180 |
| Persons who once had tuberculosis..... | 1,200,000 | 720 |
| Total cases plus persons who once had tuberculosis..... | 2,000,000 | 1,200 |

¹ All estimates rounded to the nearest 50,000. Rates are rounded to the nearest 10 per 100,000 population.

² Based on population of the continental United States for July 1, 1956, as published in Bureau of Census Current Population Reports, series P-25, No. 146.

therapy for substantial periods of time after they have ceased to be active. The revised 1952 estimates of known cases indicate that of the total cases known to health departments at that time, 45 percent were active. In 1956 the proportion of these cases known to health departments was somewhat less, about 40 percent. Although the proportion of inactive cases was larger in 1956 than in 1952 (fig. 2), the actual number of inactive cases known to health departments was about the same in 1956 as in 1952 (table 2).

Basis of 1956 Estimates

Source data on which these estimates were based varied greatly in reliability. The following sections of this report describe the source materials and methods used in a way to permit evaluation of the soundness of the separate estimates derived.

Known Active Cases

The known active cases include: (a) all diagnosed cases of tuberculosis in tuberculosis hospitals (including a small number of cases diagnosed other than active, but excluding suspects or persons under observation for tuber-

Table 2. Tuberculosis cases and persons who once had tuberculosis, 1952 and 1956, showing number and percent change¹

| Category | 1952 estimates | | 1956 estimates | Percent change 1952-56 ³ |
|---|----------------|-----------------------|----------------|-------------------------------------|
| | Published | Adjusted ² | | |
| Total cases..... | 1,200,000 | 950,000 | 800,000 | -15 |
| Known..... | 500,000 | 450,000 | 400,000 | -10 |
| Unknown..... | 700,000 | 500,000 | 400,000 | -20 |
| Active cases..... | 400,000 | 350,000 | 250,000 | -30 |
| Known..... | 250,000 | 200,000 | 150,000 | -20 |
| Unknown..... | 150,000 | 150,000 | 100,000 | -35 |
| Inactive cases..... | 800,000 | 600,000 | 550,000 | -10 |
| Known..... | 250,000 | 250,000 | 250,000 | 0 |
| Unknown..... | 550,000 | 350,000 | 300,000 | -15 |
| Persons who once had tuberculosis..... | | 1,050,000 | 1,200,000 | +15 |
| Total cases plus persons who once had tuberculosis..... | | 2,000,000 | 2,000,000 | 0 |

¹ All estimates rounded to the nearest 50,000.

² Adjusted according to information available since publication of the 1952 estimates.

³ Percent changes were computed from the 1952 adjusted estimates and the 1956 estimates before any rounding. Percentages rounded to the nearest 5 percent. The basic data available for arriving at these estimates are not precise enough to lend confidence to small differences resulting from further manipulation of these figures.

Figure 1. Hospitalization status of known active cases, 1952 and 1956

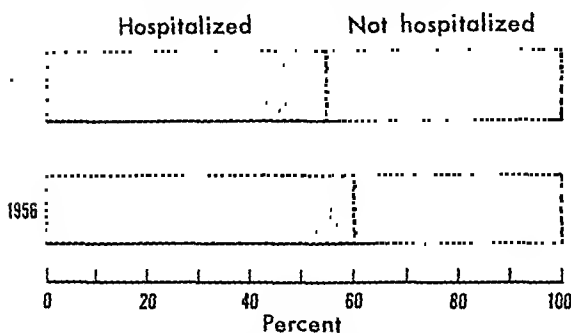
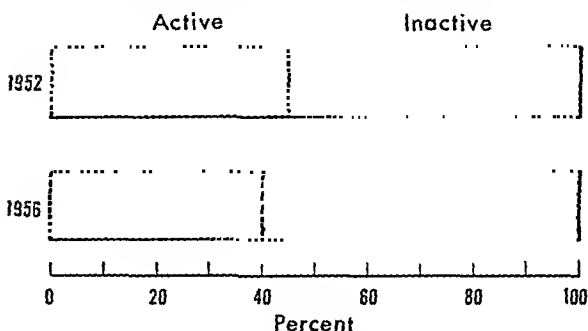


Figure 2. Clinical status of all cases known to health departments, 1952 and 1956



culosis); (b) clinically active cases in mental and penal institutions; and (c) all cases clinically active at home and known to health departments.

The sources of the data for known cases were:

- The Public Health Service tuberculosis bed census of April 1, 1956, giving the number of tuberculosis beds occupied in all Federal and non-Federal hospitals, except mental and penal institutions, having facilities for treating tuberculosis.

- The Tuberculosis Hospital and Sanatorium Directory published in 1954 by the National Tuberculosis Association showing the number of tuberculosis beds in mental and penal institutions in 1953.

- Annual tuberculosis reports prepared by State health departments and submitted to the Public Health Service, showing the number of cases hospitalized and active cases at home.

- Tuberculosis case register summary reports received by the Public Health Service from State and local health departments, showing cases known to health departments (2).

- The nationwide nonhospitalized tuberculosis patient study conducted by the Tuberculosis Program of the Public Health Service in 1954 and 1955 (3, 4).

- Additional supplementary data, such as published reports of health departments.

The tuberculosis bed census includes data on all tuberculosis beds in the Nation, except those in mental and penal institutions. The 80,000 tuberculosis beds occupied as reported by the bed census may be taken as the total number of cases in all hospitals except mental and penal institutions. These data were substan-

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The resulting estimate was adjusted for overstatement on the basis of the experience of case review in the nonhospitalized tuberculosis patient study. From 35 to 40 percent of the cases originally listed as active and at home

were found to be dead, hospitalized, moved away, lost, or no longer active, and therefore were removed from the list of active cases. A check of the cases classified as activity undetermined and a search of other records for more cases resulted in the addition of almost 10 percent to the active cases at home which remained after the review of the original list (4). The resulting net reduction was about 30 percent. When this adjustment was applied to the estimated figure for the national total, an estimate of 60,000 active cases at home was obtained.

When added to the 90,000 cases hospitalized, these 60,000 nonhospitalized active cases gave an estimated total of 150,000 known active tuberculosis cases in 1956. This estimate was substantiated by other data. For example, the proportion of known active cases hospitalized, approximately 60 percent, was the same proportion as was found independently in the non-hospitalized patient study.

The experience of the nonhospitalized patient study conducted in 1954 and 1955, showing that case registers overstated the number of active cases at home, is as applicable to 1952 data as to 1956 data. Accordingly, the same adjustment that was made in the 1956 estimate of known active cases at home was applied to the 1952 estimate. This resulted in a revised 1952 estimate of 200,000 known active cases in the continental United States. This figure is comparable to the 1956 figure.

Unknown Active Cases

To estimate the number of unknown cases of tuberculosis in the population in 1952, the results of communitywide chest X-ray surveys were used. Since the chest X-ray survey still seemed to be the best yardstick for measuring unknown prevalence, the Public Health Service regional offices were asked in 1956 to gather results of recent chest X-ray surveys in their jurisdictions. Survey reports were received from 42 States and the District of Columbia, covering almost 14½ million X-ray examinations taken primarily during the years 1953, 1954, and 1955, in all kinds of screening programs. From these, reports were selected which gave information on the yield of com-

munitywide X-ray programs in cities, counties, and sometimes in entire States.

Added information was provided by data from the Veterans Administration, where it was the policy to give X-ray examinations routinely to all patients admitted to veterans hospitals and clinics as well as to hospital personnel caring for these patients. This program screened 5,250,000 persons from 1950 to 1955.

Summary and analysis of pertinent data from all sources indicated that the discovery rate of unknown active tuberculosis was nearly 0.7 cases per 1,000 X-ray examinations in community surveys in 1956. Since the equivalent rate was 1 per 1,000 in 1952, the prevalence of unknown active tuberculosis appears to have decreased between 30 and 40 percent from 1952 to 1956.

In 1956, there were about 117 million persons 15 years of age and over in the United States. Using the rate of 0.7 cases per 1,000 X-rays taken, there would be 80,000 unknown cases of active tuberculosis among the adult population in the country in 1956. Additional consideration must be given to other factors. First, community X-ray surveys tend to miss certain groups with high tuberculosis prevalence. One of the more sizable of these is the older age group. Response to the survey from persons 55 years of age and older is usually considerably less than for the age groups from 15 to 54. As response decreases with age, prevalence of active tuberculosis, particularly among males, increases with age. Second, the survey appeal is not generally directed toward children under 15 years of age. Cases of tuberculosis do occur among children but not in sufficient numbers to warrant their inclusion in communitywide programs.

In order to compensate primarily for the active tuberculosis missed in these two groups, it was determined on the basis of probable prevalence in the groups that an additional 20,000 cases should be added, resulting in an estimate of 100,000 unknown active tuberculosis cases in 1956.

Inactive Cases

Known inactive cases are defined as those cases which are clinically inactive and are currently reported to be under supervision by local

health departments. They include cases on drug therapy as well as other inactive cases significant for public health supervision, according to local health department standards. The only available sources of data are tuberculosis case register summary reports received from 1954 through 1956 from State and local health departments representing about one-sixth of the population of the continental United States.

Analysis of the case register reports indicates that on the average there are at least one and a half times as many inactive cases on the register as active. The experience of Public Health Service records consultants working with State and local health departments confirms this finding. It is therefore estimated that there were about 250,000 known inactive cases in 1956.

Unknown inactive cases are defined as those cases which are clinically inactive and currently need public health supervision, but are not known to the local health agency. A number of these cases may have been previously reported and later lost to supervision. The chest X-ray survey reports received from States and local areas were, to a great extent, inadequate in the reporting of inactive tuberculosis discovered in X-ray case-finding programs. The most complete data in the discovery of inactive tuberculosis were those from the Veterans Administration case-finding program.

From an analysis of all data available, it was estimated that tuberculosis case-finding programs yield between 3 and 4 unknown cases of inactive tuberculosis for every unknown active case discovered. An estimate of 300,000 unknown inactive cases significant for public health supervision in 1956 was made on the basis of this observation.

The present definition of unknown inactive tuberculosis is not strictly comparable with the definition used in arriving at the 1952 prevalence estimate. The 1952 estimate included some inactive cases that were not, at that time, significant for public health supervision. In 1952 it was estimated that there were 550,000 "important" undiscovered inactive cases. Of these it is estimated that 350,000 would have been classified as unknown inactive cases significant for public health supervision according to the 1956 definition.

Persons Who Once Had Active Tuberculosis

The data for the estimate of once active cases were more limited than the data for the other categories. As described above, estimates of known active and inactive cases were based largely on actual counts of cases hospitalized or known to health departments. Estimates of unknown active and inactive cases were based chiefly on yields of X-ray surveys. However, the estimate of persons not now requiring public health supervision was obtained by estimating the total number of persons who have or have had tuberculosis and then subtracting the estimate of all known and unknown active and inactive cases.

The estimated number of persons who have or have had tuberculosis for 1952 consisted of the 1,200,000 "important" cases estimated at that time (1) plus an additional 800,000 persons. This estimate of 800,000 is based on X-ray survey findings of cases classified as "tuberculosis—no followup necessary." The number of these persons not now requiring public health supervision was obtained by subtracting the revised estimate of 950,000 known and unknown, active and inactive cases in 1952 from the 2,000,000 total living persons who had ever had tuberculosis. The resulting figure was 1,050,000 persons not requiring public health supervision in 1952.

The 1956 estimate of the total number of cases plus the number of persons who once had tuberculosis was calculated by starting with the 1952 estimate and adding estimated tuberculosis incidence and subtracting estimated deaths from all causes in the tuberculous population between 1952 and 1956. Since the number of persons leaving the tuberculous population because of deaths from all causes was about the same as the number of new cases, the number of living persons who have or ever have had tuberculosis has remained approximately the same. Subtracting the 250,000 active cases and the 550,000 inactive cases from the estimate of 2,000,000 yields the estimate of 1,200,000 persons who once had tuberculosis but did not require public health supervision in 1956.

Conclusion

If present trends persist, the number of active and inactive tuberculosis cases will continue to

decline. This decline will be the consequence of the continuing decrease in incidence and the increasing recovery rate.

The number of persons who have once had tuberculosis will probably begin to decline in the years immediately ahead. This group of persons who once had tuberculosis is composed largely of older persons, and it can be expected that deaths from all causes will deplete this group more rapidly than the rate of entry of newly recovered cases will enlarge it.

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- (3) Blomquist, E. T.: The nonhospitalized tuberculous patient. Am. J. Pub. Health 46: 149-155, February 1956.
- (4) Anderson, R. J., Sauer, H. I., Smith, V. B., and Roberts, D. E.: The nonhospitalized tuberculosis patient. Pub. Health Rep. 71: 888-896, September 1956.

Porterfield Appointed Deputy Surgeon General



Dr. John D. Porterfield has been named Deputy Surgeon General of the Public Health Service, succeeding Dr. W. Palmer Dearing, who is now assistant director for health in the Office of Defense Mobilization.

Dr. Porterfield, a career officer of the Public Health Service, has been an Assistant Surgeon General since March 1957. His previous post of assistant to the Surgeon General was assumed in October 1956, following service as director of the Ohio Department of Mental Hygiene and Correction since 1954, and before that, as director of the Ohio Department of Health since 1947.

Dr. Porterfield entered the Service's Commissioned Corps in 1939, and in 1946 he took part in the early development of the Research Grants Program at the National Institutes of Health.

Dr. Porterfield is a fellow of the American

Medical Association and of the American Public Health Association, in which he has held a number of posts including current membership on the executive board. President of the Middle States Public Health Association in 1956-57 and formerly secretary and vice president of the Association of State and Territorial Health Officers, Dr. Porterfield is a past regent of the American College of Preventive Medicine.

Dr. Porterfield has been on the faculties of Ohio State University College of Medicine, the University of Michigan School of Public Health, and the Cincinnati College of Medicine.

The new Deputy Surgeon General, who is the fifth generation of physicians in the Porterfield family, is a graduate of the University of Notre Dame. He received his medical degree from Rush Medical College of the University of Chicago, and his master's degree in public health from the Johns Hopkins University School of Hygiene and Public Health.

Results of screening serologic reactors found during an intensive house-to-house survey in New York City demonstrate the value of multiphasic screening procedures in suspect neighborhoods.

House-to-House Serologic Survey With Multiphasic Screening

THEODORE ROSENTHAL, M.D., and JULES E. VANDOW, M.D.

DURING the 10-week period April 18-June 25, 1955, the New York City Health Department conducted, with the cooperation of the Public Health Service, an intensive house-to-house blood testing program in the Central and East Harlem Health Districts of Manhattan. The Central Harlem Health District was selected for testing because of the known high prevalence of syphilis. This district reported 22.5 percent of all the syphilis cases in New York City in 1953 and 20.5 percent in 1954. Furthermore, the mass blood testing street survey of 1953 indicated that about 20,000 residents of this district were in need of antisyphilitic therapy. The East Harlem Health District was included in the 1955 intensive survey because it is contiguous to Central Harlem and is the fifth area in the city in syphilis prevalence, having reported 6.8 percent of the cases in 1953 and 6.3 percent in 1954. At least 2,000 persons in this district were in need of antisyphilitic treatment, according to the 1953 mass street survey.

A house-to-house serologic survey in Newark in 1954 demonstrated the special value of this type of survey (1). By concentrating on an

area of known high prevalence and proceeding systematically from house to house, and from street to street, it is possible to test more people for less money than in street surveys. A higher yield of cases of syphilis brought to treatment may also be expected.

In the 10 weeks of the survey, 23,675 persons were tested for syphilis. Testing was done in three health areas of Central Harlem and in areas 20, 25, and 29 of East Harlem. This was accomplished by 4 teams, each composed of a technician who drew the blood and a clerk who kept the records. Two teams and a publicity agent worked as a unit on a particular street. First, the publicity agent alerted the residents by personal contact, by handbills, and by posters placed in neighborhood stores. On the following day, the 2 teams began their testing, proceeding methodically from house to house. In this manner, about 400 specimens of blood were collected daily and forwarded to the health department's bureau of laboratories for serologic examination. The reports were transmitted to the division of social hygiene. Negative reports were promptly mailed to patients. Positive and doubtful reports were checked against the health department's syphilis registry to separate reactors with a previous record from others. Letters were then mailed to all reactors advising that further examinations

Dr. Rosenthal is assistant commissioner, New York City Department of Health, and Dr. Vandow is chief, division of social hygiene, bureau of preventable diseases.

should be done by their own physicians or by health department clinics. Home visits were made to those who failed to report after 1 week.

Results of Blood Testing

Of the 23,675 persons tested, 6,701 were white, 14,872 were nonwhite, and 2,102 were classified as "other." The total number included 8,739 Puerto Ricans, of whom 5,978 were classified as white, 917 as nonwhite, and 1,844 as "other." "Other" Puerto Ricans are those who could not readily be classified as either white or nonwhite. Also included in this group were 258 non-Puerto Ricans of undetermined race.

The laboratory reported a total of 3,406 abnormal serologic reactions, an overall STS reactivity rate of 14.4 percent. This does not include an estimated 10 percent who had positive Mazzini reactions which were not confirmed by Kolmer or VDRL tests. Of the 3,406 abnormal serologic reactions, 2,131 were positive and 1,275 were doubtful. The reactivity rate for nonwhites was 17.6 percent, for nonwhite Puerto Ricans 11.3 percent, for white Puerto Ricans 9.2 percent, for "other" Puerto Ricans 12.9 percent, and for "other" whites 4.0 percent.

The number and percentage of abnormal blood tests found in the survey are shown by age and sex in table 1. The percentage of abnormal reactions increases for both sexes in each succeeding age decade. Abnormal reactions in males increased from 3.9 percent in the 15-24

year age group to 25.5 percent in the 55 years and over age group. Abnormal reactions in females increased from 5.6 percent in the 15-24 year age group to 18.4 percent in the 55 years and over age group.

Results of Successive Screening

The final results of screening the reactors are shown according to race in table 2. Of the 3,406 reactors to the initial STS, 2,345 (68.8 percent) reported to the clinic or private physician for further examinations. As a result, 1,918 individuals were found to have syphilis. This was 81.8 percent of those examined and 8.1 percent of those originally tested. Of the individuals with syphilis, 1,317, or 56.1 percent of the 2,345 reactors examined, were in need of treatment.

Although most of the white persons tested in the survey were Puerto Ricans, in this study they have been considered together with nonwhites and "other" Puerto Ricans. In a group of 723 white persons, not Puerto Ricans, residing in the Harlem area, a reactivity rate of 4.0 percent was found. The 13 cases of syphilis discovered made up 1.8 percent of the 723 persons tested.

In the entire group of 1,918 individuals with syphilis, 406 were new cases, 911 were cases requiring further treatment, and 601 were cases which had already received adequate treatment. When this was related to the total of 23,675 persons tested, it was found that 1.7 percent had

Table 1. Number and percentage of positive and doubtful blood tests for syphilis, by age and sex, house-to-house survey, New York City, 1955

| Age | Total | | | Male | | | Female | | |
|------------------|---------------|-----------------------|---------|---------------|-----------------------|---------|---------------|-----------------------|---------|
| | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | |
| | | Number | Percent | | Number | Percent | | Number | Percent |
| All ages..... | 23, 675 | 3, 406 | 14. 4 | 11, 810 | 1, 797 | 15. 2 | 11, 865 | 1, 609 | 13. 6 |
| 10-14..... | 327 | 6 | 1. 8 | 144 | 3 | 2. 1 | 183 | 3 | 1. 6 |
| 15-24..... | 5, 330 | 248 | 4. 7 | 2, 933 | 113 | 3. 9 | 2, 397 | 135 | 5. 6 |
| 25-34..... | 6, 868 | 882 | 12. 8 | 3, 282 | 413 | 12. 6 | 3, 586 | 469 | 13. 1 |
| 35-44..... | 5, 469 | 1, 061 | 19. 4 | 2, 667 | 571 | 21. 4 | 2, 802 | 490 | 17. 5 |
| 45-54..... | 3, 378 | 712 | 21. 1 | 1, 670 | 416 | 24. 9 | 1, 708 | 296 | 17. 3 |
| 55 and over..... | 2, 251 | 491 | 21. 8 | 1, 088 | 277 | 25. 5 | 1, 163 | 214 | 18. 4 |
| Age unknown..... | 52 | 6 | 11. 5 | 26 | 4 | 15. 4 | 26 | 2 | 7. 7 |

Table 2. Results of successive screening, house-to-house survey, New York City, 1955

| Category | Number tested | STS reactors | | STS reactors examined | | Cases of syphilis found | | |
|-------------------------------------|---------------|--------------|--------------------------|-----------------------|---------------------|-------------------------|----------------------------------|--------------------------------|
| | | Number | Percent of number tested | Number | Percent of reactors | Number | Percent of STS reactors examined | Percent of total number tested |
| White - - - - - | 723 | 29 | 4 0 | 18 | 62 1 | 13 | 72 2 | 1 8 |
| Nonwhite - - - - - | 13,955 | 2,453 | 17 6 | 1,636 | 66 7 | 1,433 | 87 6 | 10 3 |
| Puerto Rican ¹ - - - - - | 8,997 | 924 | 10 3 | 691 | 74 8 | 472 | 68 3 | 5 2 |
| Total - - - - - | 23,675 | 3,406 | 14 4 | 2,345 | 68 8 | 1,918 | 81 8 | 8 1 |

¹ Includes 5,978 white and 917 nonwhite Puerto Ricans; also 1,844 Puerto Ricans and 258 non-Puerto Ricans of undetermined category.

Table 3. Number and percentage of positive and doubtful blood tests among whites and nonwhites, by age and sex, house-to-house survey, New York City, 1955

| Age | White | | | | | | Nonwhite | | | | | |
|----------------|---------------|-----------------------|----------|---------------|-----------------------|----------|--------------|-----------------------|----------|--------------|-----------------------|----------|
| | Male | | | Female | | | Male | | | Female | | |
| | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | | Total tested | Positive and doubtful | | Total tested | Positive and doubtful | |
| | | Num-ber | Per-cent | | Num-ber | Per-cent | | Num-ber | Per-cent | | Num-ber | Per-cent |
| All ages - - - | 475 | 16 | 3 4 | 248 | 13 | 5 2 | 7,112 | 1,320 | 18 6 | 6,843 | 1,133 | 16 6 |
| 10-14 - - - | 3 | - | 0 | 3 | - | 0 | 53 | 1 | 1 9 | 54 | 1 | 1 9 |
| 15-24 - - - | 77 | - | 0 | 37 | - | 0 | 1,324 | 47 | 3 5 | 1,213 | 77 | 6 3 |
| 25-34 - - - | 102 | 4 | 3 9 | 60 | 2 | 3 3 | 2,089 | 293 | 14 0 | 2,214 | 346 | 15 6 |
| 35-44 - - - | 90 | 1 | 1 1 | 52 | 5 | 9 6 | 1,818 | 439 | 24 1 | 1,658 | 353 | 21 3 |
| 45-54 - - - | 94 | 5 | 5 3 | 43 | 2 | 4 7 | 1,110 | 313 | 28 2 | 1,025 | 224 | 21 9 |
| 55 and over | 108 | 6 | 5 6 | 51 | 4 | 7 8 | 704 | 223 | 31 7 | 665 | 131 | 19 7 |
| Unknown - - | 1 | - | 0 | 2 | - | 0 | 14 | 4 | 28 6 | 14 | 1 | 7 1 |

newly discovered syphilis, and 3.8 percent had syphilis requiring additional treatment. Thus 5.5 percent of the total number tested were in need of treatment. The 406 new cases of syphilis were diagnosed as follows: primary 1, secondary 7, early latent 34, late and late latent 353, and congenital 11.

Nonwhite Population Tested

A total of 13,955 nonwhites were tested in the survey (table 2). Positive or doubtful serologic reactions occurred in 2,453, or 17.6 percent. The reactivity rate, lowest in the 10-14 year age group (1.9 percent), rose in each successively

older group, until it reached the high level of 25.9 in the 55 years and over age group (table 3). In general, males had a slightly higher rate than females, 18.6 percent compared with 16.6 percent. However, the rate for females was somewhat higher than for males in the 15-24 and 25-34 year age groups dropping below the rate for males after 35 years.

Among the 1,433 cases of syphilis found in the nonwhite reactors examined, 313 had syphilis never previously treated, 681 had syphilis requiring further treatment, and 439 had syphilis requiring no additional treatment. Thus, of the 13,955 nonwhites tested, 2.2 percent had newly discovered syphilis and 4.9 percent had

Table 4. Number and percentage of positive and doubtful blood tests among Puerto Ricans, by age and sex, house-to-house survey, New York City, 1955

| Age | White | | | | | | Nonwhite | | | | | | Other (category undetermined) ¹ | | | | | |
|-----------------|---------------|-----------------------|---------|---------------|-----------------------|---------|---------------|-----------------------|---------|---------------|-----------------------|---------|--|-----------------------|---------|---------------|-----------------------|---------|
| | Male | | | Female | | | Male | | | Female | | | Male | | | Female | | |
| | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | | Number tested | Positive and doubtful | |
| | | Number | Percent | | Number | Percent | | Number | Percent | | Number | Percent | | Number | Percent | | Number | Percent |
| All ages... | 2, 830 | 303 | 10. 7 | 3, 148 | 246 | 7. 8 | 431 | 47 | 10. 9 | 486 | 57 | 11. 7 | 962 | 111 | 11. 5 | 1, 140 | 160 | 14. 0 |
| 10-14..... | 66 | 1 | 1. 5 | 74 | 1 | 1. 4 | 6 | --- | . 0 | 24 | --- | . 0 | 16 | 1 | 6. 3 | 28 | 1 | 3. 6 |
| 15-24..... | 1, 023 | 48 | 4. 6 | 792 | 28 | 3. 5 | 183 | 3 | 1. 6 | 95 | 4 | 4. 2 | 326 | 15 | 4. 6 | 260 | 26 | 10. 0 |
| 25-34..... | 732 | 75 | 10. 2 | 888 | 68 | 7. 7 | 112 | 12 | 10. 7 | 122 | 17 | 13. 9 | 247 | 29 | 11. 7 | 302 | 36 | 11. 9 |
| 35-44..... | 497 | 80 | 16. 1 | 696 | 68 | 9. 8 | 69 | 17 | 24. 6 | 110 | 16 | 14. 5 | 193 | 34 | 17. 6 | 286 | 48 | 16. 8 |
| 45-54..... | 301 | 63 | 20. 9 | 408 | 35 | 8. 6 | 40 | 12 | 30. 0 | 77 | 9 | 11. 7 | 125 | 23 | 18. 4 | 155 | 26 | 16. 8 |
| 55 and over.. | 202 | 36 | 17. 8 | 285 | 46 | 16. 1 | 19 | 3 | 15. 8 | 55 | 10 | 18. 2 | 55 | 9 | 16. 4 | 107 | 23 | 21. 5 |
| Age unknown.... | 9 | --- | . 0 | 5 | --- | . 0 | 2 | --- | . 0 | 3 | 1 | 33. 3 | --- | --- | . 0 | 2 | --- | . 0 |

¹ Includes 258 non-Puerto Ricans of undetermined category.

syphilis requiring further treatment. The 994 individuals with syphilis brought to treatment because of the survey represent 7.1 percent of those originally tested.

Population estimates by race and age are not available for 1955. However, the estimated population of the Central Harlem District, as of July 1, 1955, does not differ markedly from the census enumeration, 250,000 in 1955 compared with 259,594 in 1950, of whom 222,033 were 10 years old or older. Data from the 1950 Federal census are therefore utilized in the following computations.

According to the 1950 census, about 66,089 persons over 10 years of age reside in the three health areas of Central Harlem that were tested. The survey tested 18.5 percent of these and about 5.5 percent of the entire district. About 95 percent of the residents of Central Harlem are nonwhite. By applying the syphilis rates for nonwhites found in the survey, it is estimated that 1,454 persons with undiscovered syphilis reside in these areas. The survey found 313 of these, leaving 1,141 still undiscovered. Similarly, it is estimated that 3,238 persons with syphilis requiring further treatment reside in these areas. The survey

found 681 of these, leaving 2,557 still undiscovered. From this it is apparent that the survey succeeded in finding only about one-fifth of the syphilitics requiring treatment in these health areas.

By applying the same percentages to the entire population over age 10 of the Central Harlem Health District and deducting the cases found in the survey, it is estimated that there are 4,572 undiscovered syphilitics and 10,199 syphilitics requiring further treatment, or altogether a total of 14,771. This emphasizes the need for continued serologic surveying, education, and vigilant venereal disease control effort.

Puerto Rican Population Tested

Morbidity data do not furnish accurate information regarding the incidence of syphilis among Puerto Ricans in New York City (2). For this reason an attempt was made to obtain this information by including a question as to national origin on the report form used in the survey.

Altogether, 8,997 Puerto Ricans over age 10 were tested and 924, or 10.3 percent, had posi-

tive or doubtful blood tests (table 2). About three-quarters of these reactors reported for examination, and syphilis was discovered in 472, or 68.3 percent of the reactors examined, and this was 5.2 percent of the 8,997 Puerto Ricans tested. Of the Puerto Ricans tested, new cases of syphilis were found in 1.0 percent, cases requiring additional treatment in 2.5 percent, and 1.6 percent were cases that had already received adequate treatment. Thus, 3.5 percent of Puerto Ricans tested in the survey had syphilis requiring treatment.

Syphilis was only half as prevalent among the Puerto Ricans tested as among the nonwhites tested. Of interest was the finding that on the basis of available evidence reactions to serologic tests for syphilis were considered as false positive in 31.7 percent of the Puerto Rican reactors. This was almost three times the percentage of false positive tests found in the indigenous nonwhite group. These apparent differences warrant further study with the newer laboratory procedures which utilize specific antigen.

Table 4 gives the number and percentage of positive and doubtful blood tests by age, sex, and race. The reactivity rate for the white Puerto Ricans was 9.2 percent; 10.7 percent for males and 7.8 percent for females. The rate increased with age and was highest in the 55 years and over age group. The reactivity rate for nonwhite Puerto Ricans was 11.3 percent; 10.9 percent for males and 11.7 percent for females. The reactivity rate for "other" Puerto Ricans was 12.9 percent; 11.5 percent for males and 14.0 percent for females. A small number of indigenous individuals of undetermined ancestry could not be separated from the Puerto Ricans of undetermined ancestry. These two groups, 1,844 Puerto Ricans and 258 non-Puerto Ricans are combined in the table. As with white and nonwhite Puerto Ricans, the reactivity rates increased with age.

Of the 87 new cases of syphilis found among Puerto Ricans, 2 were secondary, 8 were early latent, 72 were late latent, and 5 were congenital syphilis.

An accurate estimate of the potential number of STS reactors and cases of syphilis in the population of the entire East Harlem Health District is difficult to make from the data avail-

able from the survey. This is because the population is not as homogeneous as in the Central Harlem district, and because of inadequate sampling. An estimate will therefore be made only for areas 20 and 25 of the East Harlem Health District where, with the exception of 605 specimens taken in area 29, practically all of the tests were done.

The population of areas 20 and 25 is almost entirely Puerto Rican. According to the 1950 census, there are 44,200 persons over age 10 residing in these areas. In the survey, approximately one-fifth of the residents over age 10 were tested for syphilis. Assuming that the same percentages of syphilis in Puerto Ricans found in the survey held for the entire population in these areas, it may be estimated that there are 355 cases of undiscovered syphilis and 880 cases of syphilis requiring additional treatment, a total of 1,235 cases in need of antisyphilitic therapy.

Multiphasic Screening of Reactors

Of the 3,406 persons with positive blood tests in the survey, 2,116 reported to the health department clinic and underwent a multiphasic screening procedure. This included a complete physical examination, repetition of the blood test, genital smears for gonorrhea (done routinely in women and only when indicated in men), a urine examination for sugar, and an X-ray of the chest. Papanicolaou smears of the cervical secretions in 1,011 female reactors over 21 years of age were also obtained. These were

Table 5. Results of multiphasic screening of serologic reactors, house-to-house survey, New York City, 1955

| Condition | Number reactors screened | New cases found | |
|-----------------------------|--------------------------|-----------------|---------|
| | | Number | Percent |
| Syphilis ¹ | 2, 116 | 344 | 16. 3 |
| Gonorrhea..... | 2, 116 | 18 | . 8 |
| Diabetes..... | 2, 116 | 23 | 1. 0 |
| Carcinoma of cervix..... | 1, 011 | 13 | 1. 3 |
| Chest disease..... | (2) | 23 | ----- |

¹ New cases. An additional 62 new cases were found by private physicians and other clinics.

² Number of individuals X-rayed was not determined. (See text.)

examined by the cancer detection service of the bureau of adult hygiene.

As a result of these procedures, the following conditions were discovered:

Genereal disease

Syphilis:

| | |
|--|-----|
| Number new cases..... | 344 |
| Number cases requiring additional treatment..... | 348 |
| Number cases not requiring additional treatment..... | 564 |
| Gonorrhea (females 16, males 2)..... | 18 |
| Nongonococcal urethritis..... | 1 |
| <i>Glycosuria</i> | |
| Number individuals with glycosuria..... | 60 |
| <i>Diabetes:</i> | |
| Previously known..... | 23 |
| Under treatment..... | 13 |
| Returned to treatment..... | 10 |
| Not previously known..... | 23 |
| Excluded on reexamination..... | 6 |
| Failed to return for reexamination..... | 8 |

Abnormal chest findings by X-ray

Tuberculosis:

| | |
|------------------------------|---|
| Active..... | 3 |
| Arrested..... | 2 |
| Cured..... | 3 |
| Type not disclosed..... | 1 |
| Stage undetermined..... | 1 |
| Suspicious..... | 1 |
| Pneumonitis..... | 1 |
| Cystic disease of lungs..... | 1 |
| Aneurysm..... | 5 |
| Enlarged heart..... | 5 |

Abnormal Papanicolaou smears

| | |
|---|----|
| Squamous cell carcinoma in situ..... | 12 |
| Invasive squamous cell carcinoma..... | 1 |
| Suspicious, still under study..... | 6 |
| Chronic endocervicitis with squamous metaplasia, still under study..... | 3 |
| Chronic endocervicitis..... | 7 |
| Cervical polyp..... | 1 |

Table 5 gives the number and percentage of new cases of syphilis, gonorrhea, diabetes, carcinoma of the cervix, and chest disease found in the survey. The large number of syphilis cases was to be expected since the individuals examined were all serologic reactors. The 16 cases of gonorrhea in women were asymptomatic. The 23 new diabetics found were referred to hospital clinics and private physicians who confirmed the diagnosis with blood sugar determinations. In addition, 10 known diabetics who were not under medical care were referred for further examination and treat-

ment. The 13 women with carcinoma of the cervix had biopsies which confirmed the diagnosis made by examination of the Papanicolaou smears. All were referred for surgical treatment. Patients with lung or heart disease were also referred for appropriate treatment of their condition.

These results confirm the value of multiphasic screening procedures in areas where the population is predominantly nonwhite. Since this was primarily a syphilis case-finding project, arrangements could not be made for the multiphasic screening of individuals who did not react to the initial blood test. The data indicate that a broader type of survey would have yielded many more cases of diabetes, chest disease, and cancer.

Summary

1. A house-to-house blood testing survey was conducted by the New York City Health Department in the Harlem section of Manhattan over a 10-week period during the spring of 1955.

2. A total of 23,675 persons were tested. These included 14,872 nonwhites, 6,701 whites, and 2,102 "others." The STS reactivity rate for the entire group was 14.4 percent.

3. Syphilis was found in 1,918 individuals, 8.1 percent of those tested; 406 were new cases, 911 were cases requiring further treatment, and 601 cases had been adequately treated.

4. Syphilis was found to be twice as prevalent in nonwhites as in the Puerto Ricans tested.

5. Reactions to serologic tests for syphilis (STS) considered as false-positive apparently occurred in 31.7 percent of the Puerto Rican reactors, three times the percentage found in the nonwhite group.

6. Of the STS reactors of all categories examined, 81.8 percent had syphilis and 56.1 percent were in need of treatment.

7. It is estimated that there are 14,771 nonwhites in the Central Harlem District who are in need of antisyphilitic treatment. Similarly it is estimated that in two areas of East Harlem that were tested there are 1,235 Puerto Ricans in need of antisyphilitic treatment.

8. Multiphasic screening of the reactors resulted in finding 18 persons with gonorrhea, 23

with previously unknown diabetes, 13 women with squamous cell carcinoma of the cervix, 3 persons with active pulmonary tuberculosis, and 20 persons with evidence of heart or lung conditions. These results confirm the value of utilizing multiphasic screening procedures in suspect neighborhoods.

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Traineeships in Neurological and Sensory Disorders

A new program of grants to research scientists for advanced training in neurological and sensory disorders has been announced by the National Institute of Neurological Diseases and Blindness, Public Health Service. The awards are designed to help research scientists obtain additional specialized training for careers in teaching and research.

A previous program, under which about 75 scientists received advanced training in 1957, was concerned only with clinical training. The current program encourages advanced training in either the clinical field or in such basic science areas as neurochemistry, neuropharmacology, neurophysiology, or neuroanatomy.

The traineeships may be awarded for study at any institution in the United States or abroad qualified to give the particular training desired. During training, which may begin within 10 months of the date of the award, the trainee will not be permitted to carry on the private practice of medicine.

Generally, the awards will be made for not less than 9 months and for not more than a year. They may be renewed, however, and in this way may continue up to a period of 3 years. Stipends range from \$5,500 to \$14,800 a year, according to the applicant's qualifications and training needs.

Applicants must be citizens of the United States or must have filed declarations of intent to become citizens. They must be free of any disability that would interfere with the proposed training. In addition, they must have completed either the residency in a clinical specialty, or its equivalent, or at least 3 years of pertinent postdoctoral training or research experience.

Application forms and instructions may be obtained by writing to the Chief, Extramural Programs Branch, National Institute of Neurological Diseases and Blindness, National Institutes of Health, Public Health Service, Bethesda 14, Md.

Long-Acting Penicillin in Gonorrhea Control

MICHAEL J. TAKOS, M.D., M.P.H., LEE W. ELGIN, M.D., and T. ELAM CATO, M.D., M.P.H.

PREVENTION of the spread of gonorrhea from one person to another is one of the most difficult problems in venereal disease control. Individuals acquiring gonorrhea can spread the disease after only a brief incubation period. Unlike syphilis, there are no long periods when it is virtually impossible to transmit the disease.

The principal factor behind the difficulty in controlling gonorrhea is that the infected female is usually completely unaware that she has an infectious disease. Unpublished studies of 318 women with laboratory proved diagnoses of gonorrhea infection at the Dade County Venereal Disease Control Clinics showed that only 22 (6.9 percent) came to the clinics because they themselves were aware that they were infected. Of this group, 12 reported on questioning that they did not know they had this disease until they were so informed by their latest sexual partners. Thus, only 10 females, or 3.1 percent of the group studied, had developed symptoms of sufficient severity to cause them to seek medical assistance. In contrast, of 711 males

studied, 701, or 98.6 percent, came into the clinics voluntarily because they knew they were infected.

Adding to the difficulties of gonorrhea control is the fact that our present laboratory methods of demonstrating neisserian infection in the female by smear and culture techniques are not very effective. Furthermore, the clinical diagnosis of uncomplicated gonorrheal infection in the female is quite difficult. Thus, the male urethra still remains the most effective culture and diagnostic medium known for indicating which women in the population are harboring the gonococcus.

Methods

Consideration of these epidemiological facts led to a change in the gonorrhea control program of the venereal disease control clinics in an attempt to decrease the the rate of spread of the disease in Dade County, Fla.

All female contacts of male gonorrhea patients at the clinics who came within the jurisdiction of the health department were treated with 2.4 million units of benzathine penicillin G (Bicillin). This dosage was given in divided doses of 4 cc. (1.2 million units) in each buttock. Studies by various investigators have shown that this procedure allows the maintenance of effective therapeutic blood levels of penicillin for at least 6 weeks (1-3). The objective of this therapy was to cure the patients of their neisserian infection, and, at the same time, to protect them from reinfection by the gonococcus for approximately 6 weeks. Thus, we would create an interlude during which women al-

This paper is a joint contribution of the Dade County Health Department and the section of preventive medicine, University of Miami School of Medicine, Miami, Fla. The authors are all members of the Dade County Health Department. Dr. Takos, formerly head of the venereal disease control division, is now in charge of the research and special studies division; Dr. Elgin is the present head of the venereal disease control division; and Dr. Cato is the health commissioner. Dr. Takos and Dr. Cato are also instructors in preventive medicine, University of Miami School of Medicine.

ready known to have been infected would not be able quickly to reacquire the disease and so continue to spread it in the community. It seemed reasonable to assume that those women who already had gonorrhea were those most likely to get it again. This assumption is borne out by the data from our studies of 318 women with neisserian infections. Of this group, 93 (29.2 percent) had previous diagnoses of gonorrhea infection on the clinic records.

In the clinics, we continued to treat male gonorrhea patients with the previously used standard therapy of 600,000 units of 72-hour repository penicillin (aqueous procaine penicillin G with aluminum monostearate). This had been our standard therapy in the past for both males and females. The males were cured within a week and could be reinfected by the gonococcus as soon as the therapeutic blood level of penicillin disappeared. Our objective was to continue using the males as a medium through which to find the infected female reservoirs of neisserian disease in the population. Possibly the total number of individuals infected with the gonococcus could have been sharply reduced by using Bicillin therapy for both males and females since nearly 44 percent of our male patients become reinfected in less than 6 months. But this technique would also have eliminated the best method now available for locating females with gonorrhea.

Table 1. Total laboratory-proved gonorrhea cases treated at Dade County, Fla., clinics, 1953-56

| Month | 1953 | 1954 | 1955 | 1956 |
|----------------------|-------|-------|-------|-------|
| January | 142 | 194 | 147 | 119 |
| February | 118 | 200 | 108 | 122 |
| March | 143 | 196 | 133 | 114 |
| April | 165 | 177 | 128 | 108 |
| May | 167 | 155 | 127 | 145 |
| June | 186 | 159 | 149 | 112 |
| July | 196 | 146 | 129 | 148 |
| August | 169 | 152 | 168 | 128 |
| September | 158 | 137 | 156 | 118 |
| October | 178 | 165 | 136 | 162 |
| November | 172 | 160 | 127 | 89 |
| December | 185 | 121 | 126 | 99 |
| Total | 1,979 | 1,962 | 1,634 | 1,464 |
| Mean cases per month | 164.9 | 163.3 | 136.1 | 122.0 |

¹ Benzathine penicillin program started.

Table 2. Total gonorrhea cases in Florida metropolitan areas before and after period of use of benzathine penicillin in Miami, January 1954-February 1955

| Month | Miami | Jacksonville | Tampa |
|--|-------|--------------|-------|
| Prior to benzathine penicillin program | | | |
| 1954 | | | |
| January | 171 | 99 | 67 |
| February | 163 | 78 | 67 |
| March | 119 | 92 | 94 |
| April | 182 | 83 | 103 |
| May | 163 | 120 | 73 |
| Total cases | 798 | 472 | 404 |
| Mean cases per month | 159.6 | 94.4 | 80.8 |
| After benzathine penicillin program | | | |
| June | 115 | 110 | 80 |
| July | 113 | 72 | 112 |
| August | 115 | 156 | 62 |
| September | 123 | 107 | 87 |
| October | 170 | 128 | 119 |
| November | 117 | 71 | 64 |
| December | 138 | 178 | 73 |
| 1955 | | | |
| January | 103 | 56 | 65 |
| February | 104 | 158 | 72 |
| Total | 1,098 | 1,036 | 734 |
| Mean cases per month | 122.0 | 115.1 | 81.6 |

The Bicillin program was begun in June 1954 at all of the venereal disease control clinics in Dade County. During the first 2 months, smears and cultures were run once a week for 3 weeks on the females treated with Bicillin to check the effectiveness of the method. Of 48 women whom we were able to follow for 3 successive weeks, none had positive smears or cultures. Hookings and Graves (4) have reported similar results from their studies in Tennessee.

In Dade County, we use a modified "speed-zone" system of epidemiological tracing of the contacts of gonorrhea patients; because of the highly mobile nature of our population, we do not discontinue contact tracing until several months after a contact is first reported. Other than the use of benzathine penicillin, the only new factor added to our routine is a firm policy of refusing to treat male gonorrhea patients with long clinic records who would not or had

not furnished us with the names of traceable female contacts. However, this procedure had been in unofficial use for some time prior to June 1954. We reported to the central registry unit of the Florida State Board of Health all cases diagnosed but not treated.

Results

Once the program had a good start, we expected to see a falling off of the number of proved gonorrhea cases treated at the venereal disease control clinics. Proved gonorrhea cases are those having either positive smears or cultures, or both. Female contacts of males with gonorrhea are not considered cases unless positive laboratory evidence is obtained. This expectation was promptly borne out by the total number of proved gonorrhea cases coming to therapy at the clinics (table 1). The first 6 months of 1954 averaged 180.1 cases of gonorrhea per month treated at the clinics, while the last 6 months averaged only 146.8 cases per month. So a decrease in the number of cases of gonorrhea did occur shortly after benzathine penicillin began to be used and has continued during succeeding years.

One factor which had to be considered was the possibility that the evident decrease in the number of gonorrhea cases was artificial due to some statistical factor other than the Bicillin program. To help eliminate serious consideration of this point, the venereal disease control regis-

try unit of the Florida State Board of Health was asked to send us all monthly records of gonorrhea cases reported by clinics and private practitioners from within the city limits of Miami, Jacksonville, and Tampa, the three largest metropolitan centers in the State. Benzathine penicillin was not used in the venereal disease clinics in Jacksonville or Tampa during the period for which data are presented in table 2. These data show a marked falling off in the incidence of gonorrhea cases in the Miami area during a period when the incidence became higher in Jacksonville and showed no significant change in Tampa. These figures have been checked through Student's *t* test and are significant (table 3).

The best indication of the effectiveness of a control program is its effects on the community rates for the disease in question. Table 4 presents the data on total gonorrhea cases reported from Dade County at venereal disease clinics and by private practitioners and gives the estimated permanent population of the area and the gonorrhea morbidity rates. The morbidity rate was 2.1 per 1,000 in 1956 and averaged 3.1 during 1952, 1953, and 1954. If the average rate for 1956 had been 3.1 per 1,000, we should have had 2,276 cases of gonorrhea rather than the 1,554 actually reported.

Another possible source of distortion of these data would be selective treatment of females by deliberately searching them out. This might result in a rate higher than that usually ob-

Table 3. Standard error of the difference of the means and probability of the data in table 2

| | Miami | Jacksonville | Tampa |
|-----------------------------------|-------------------------------------|-----------------|-----------------|
| Standard error of mean difference | 12.8 | 22.7 | 19.8 |
| Student's <i>t</i> | 2.9 | 0.9 | 0.04 |
| Probability | 0.02 > <i>p</i> > .01 | <i>p</i> > 0.05 | <i>p</i> > 0.05 |
| Meaning | Significant 1:50 > <i>p</i> > 1:100 | Not significant | Not significant |

Small sample method (Student's *t*): Null hypothesis: the two samples are drawn from populations identical both as to mean and variance.

$$\text{Pooled estimate of variance } s^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$$

$$\text{Standard error for the difference of the means } \hat{\sigma}_w = \hat{s} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$t = \frac{[\bar{x}_1 - \bar{x}_2]}{\hat{\sigma}_w}$$

SOURCE: Moroney, M. J.: Facts from figures. Rev. ed. Baltimore, Penguin Books, 1954, p. 227 and seq.

Table 4. Total gonorrhea cases, population, and gonorrhea morbidity rates, Dade County, Fla., 1952-56

| Year | Total reported cases | Estimated population ¹ | Rate per thousand |
|-----------|----------------------|-----------------------------------|-------------------|
| 1956----- | 1, 554 | 734, 142 | 2. 1 |
| 1955----- | 1, 663 | 703, 777 | 2. 4 |
| 1954----- | 2, 030 | 658, 460 | 3. 1 |
| 1953----- | 1, 994 | 617, 616 | 3. 1 |
| 1952----- | 1, 808 | 576, 772 | 3. 1 |

¹ As calculated by vital statistics division, Dade County Health Department.

tained. Data from the Dade County clinics show that this has not occurred. During 1953, 30 percent of the proved gonorrhea cases were in females. This proportion of females to the total number of cases has varied between 30 and 35 percent during the entire period covered here. One other factor, not previously mentioned, was the possible effects of a shift in the population of this area toward a greater proportion of white than Negro residents. Since our clinic records show a ratio of 9 Negroes to 1 white with gonorrhea, any decrease in the proportion of Negroes in the resident population might well be expected to account for a decrease in gonorrhea rates. This has not occurred. In 1953, 13.1 percent of the resident population were Negroes; in 1956, 13.9 percent. Hence a decline in the gonorrhea rates took place during a period when the proportion of Negroes in the population showed a slight increase.

Treatment Failures

There have been six instances of treatment failure in females. Treatment is considered to be a failure when the female is reported as transmitting gonorrhea during a period within 6 weeks after receiving benzathine penicillin. In two of these cases, searching inquiry into dates of exposure showed that the patients had become infected and had transmitted the disease during the seventh week after receiving benzathine penicillin. One woman supposedly infected a sailor about 4 weeks after receiving benzathine penicillin. She was examined about a week later, and repeated smears and cultures were negative for gonococcus. This woman was

a prostitute and had had sexual congress with at least three customers during the same evening in which infection probably occurred in the sailor, who denied other exposure. It is possible that the man may have been infected by discharges of the other customers remaining in the vaginal vault. We do not know what happened in the other three cases, except that the infection was transmitted during the fifth week following benzathine penicillin therapy. Perhaps these women excreted penicillin faster than others or somehow failed to obtain the total dosage.

Discussion

A steady decline in the total incidence of gonorrhea in the Dade County area occurred after initiation of the program of using benzathine penicillin for the treatment of gonorrhea in females. Data are presented showing a reduction in the total numbers of infected persons coming to the venereal disease control clinics and in the general gonorrhea morbidity rates for the community. The number of cases declined in Miami during a time when the number of cases was not decreasing in other metropolitan areas of Florida.

The use of benzathine penicillin apparently creates a period when reinfection becomes virtually impossible for the female. It is also possible that long-acting penicillins may be more effective than our previously used therapy in obtaining a complete cure in the female with neisserian infection. Either or both of these explanations may be operating, but we do not have sufficient evidence to prove this point. Males are treated with short-acting penicillin in order that they may be used for locating gonorrhea-infected women in the population. Satisfactory results were obtained in the Dade County area, even though we used a modification of the "speed zone" epidemiology method of contact tracing.

To be effective, the long-acting penicillin method requires that a fairly large proportion of infected women be brought to treatment. In Dade County we locate nearly half of our proved female gonorrhea cases by routine smear and culture examinations of women and girls in the local jails, of health card applicants, and

of individuals coming to county maternity centers. Only about 35 percent of our laboratory-proved cases of gonorrhea in females are found through contact tracing. Female contacts of men with gonorrhea are treated with benzathine penicillin but are not counted as gonorrhea cases unless the diagnosis is confirmed by the laboratory studies.

It is hard to assay any difficulties produced by a drug in those who receive it. The massive doses of benzathine penicillin used in our clinics apparently did not produce any more allergic reactions in patients than did the smaller doses of short-acting penicillins. There were many complaints of pain in the buttocks after injection, and an occasional individual had some difficulty in walking after Bicillin therapy. None of these effects lasted more than 24 hours, and those affected were usually the highly excitable individuals.

Long-acting penicillin certainly does not offer a panacea for the immediate elimination of gon-

orrhea from a population. But it does offer a possibility for a slow, steady decline which may eventually decrease the numbers of infected individuals to a point where the disease can be considered to be effectively controlled.

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Advisory Group on Medical Research and Education

A group of special consultants have been appointed by the Secretary of Health, Education, and Welfare to advise him on the status and future needs of medical research. The consultants will investigate such questions as the impact of the expanding research programs on medical education, the availability of scientists, technicians, and facilities, and the relative emphasis on research in the various disease fields. Other subjects to be studied are the relative emphasis given to fundamental studies in the basic sciences generally, the relationship between Federal and private research programs, and the standards for approval of research projects.

Chairman of the group is Dr. Stanhope Bayne-Jones, former dean of the Yale Medical School, and more recently presi-

dent of the New York Hospital-Cornell Medical Center Joint Administration Board and technical director of research in the Army Medical Research and Development Program. Other members are:

Dr. George Packer Berry, dean, Medical School, Harvard University; Thomas P. Carney, vice president, Eli Lilly & Co.; Dr. Lowell T. Coggeshall, dean, division of biological sciences, University of Chicago.

Fred Carrington Cole, vice president, Tulane University; Samuel Lenher, vice president, E. I. du Pont de Nemours Co.; Dr. Irvine H. Page, director of research, Cleveland Clinic Foundation; Robert C. Swain, vice president in charge of research and development, American Cyanamid Co.

Dr. Stafford L. Warren, dean, School of Medicine, University of California Medical Center; and James Edwin Webb, president and general manager, Republic Supply Co. (former Under Secretary of State and former Director of the Bureau of the Budget).

HISTOPLASMOSIS

CHESTER W. EMMONS, Ph.D.

JUST 51 years ago at Ancon Hospital in the Canal Zone, Dr. Samuel T. Darling, in one of his studies observed and first described histoplasmosis (1). This mycosis, perhaps more than any other, has drawn the attention of the medical world to the importance of fungus infections of man. The discovery was actually a byproduct of a search for another disease. The frequent occurrence of splenomegaly and the known occurrence of cutaneous leishmaniasis in Latin America had suggested to observers that visceral leishmaniasis also might occur in that area. Darling was searching for kala-azar when, on December 7, 1905, examining smears from lungs, spleen, and bone marrow he observed enormous numbers of oval cells 1-4 μ in size, situated free or in alveolar epithelial cells. Influenced no doubt by the objectives of his search, he believed the intracellular organisms were flagellate protozoa and he proposed for them the name, *Histoplasma "capsulata,"* the spelling of which he corrected in a later paper.

Darling's Three Cases

The patient was a Martinique Negro admitted to the hospital only 2 days before with a disease which resembled miliary pulmonary tuberculosis. Two other cases came to Dar-

ling's attention within the space of 2½ years, and in a second paper (2) he repeated almost verbatim his description of the first case and recorded in equally discriminating clinical and pathological detail cases 2 and 3. The second patient, like the first, was a Martinique Negro recently arrived in the isthmus and the third was a Chinese, a native of Canton, who had been in the isthmus for 15 years. Darling found only these 3 cases among 83,000 hospital admissions and concluded that the disease was very infrequent in occurrence. He unsuccessfully sought the etiological agent in surface ground waters and in a wide variety of native animals and insects.

In a third paper published in 1909 (3) he again reported the three cases in detail and described histoplasmosis as a fatal infectious disease characterized by splenomegaly, emaciation, irregular pyrexia, leukopenia, and anemia with invasion of endothelial cells in the smaller lymph and blood vessels by enormous numbers of micro-organisms. He described necrosis of the liver, splenomegaly, pseudogranulomata of the lungs and intestines with ulcerations of the latter, and with necrosis of lymph nodes draining injected viscera. Although his concept of the disease included certain errors of interpretation and, being based upon a study of three fatal cases, did not encompass the full gamut of manifestations and degrees of severity recognized today, he drew a surprisingly accurate picture of fatal histoplasmosis.

Darling was convinced by this time that the disease no longer existed in Panama, and he concluded his third paper in almost the same phraseology used in his second with the prophetic statement, "The mode of infection and the portal of entry are unknown; these together

Dr. Emmons, of the Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases, Public Health Service, Bethesda, Md., gave a talk on which this paper is based before the Second Inter-American Medical Convention, April 3, 1957. The convention was sponsored by the Medical Association of the Isthmian Canal Zone and met at the University of Panama.

with the zoological status of the micro-organism may yet be ascertained by physicians living in less salubrious regions of tropical America than Panama and in those not yet disturbed by the sanitarian."

Twenty Years Later

Histoplasmosis did indeed seem to have disappeared from Panama. It was next reported 20 years later and 3,000 miles away in Minnesota (4), but under what degree of neglect on the part of the sanitarian we are not told. It reappeared also in the tropics in 1926 with the fifth report of a fatal case in a Honduran laborer on a banana plantation (5). Although the next report actually from the isthmus was that of a canine case reported by Tomlinson and Grocott in 1945 (6), it is now apparent that histoplasmosis is of frequent occurrence in Panama and undoubtedly there has been no interruption in its occurrence as a common but inapparent disease in this area. The evidence from skin tests (7, 8) and soil isolations (9) in Panama supports this concept.

Actually, the fourth human case of fatal histoplasmosis to be recognized in Panama was reported by Draheim, Mitchell, and Elton (10) in 1951, 45 years after Darling's original observations. Recent evidence of human benign infection in Panama comes also from Puckett's very important studies of coin lesions (histoplasmosomas) and healed granulomas in which, by special staining, he was able to demonstrate *Histoplasma* (11). Nine of the men in his series of 22 had lived 2 years or more in Panama. In an expanded series reported by Forsee, Puckett, and Hagman (12), 13 of 30 patients with such lesions had lived in Panama from 2 to 5 years, and there was acceptable evidence that the lesions developed during residence in Panama in 4 of these men.

The 45-year interval between Darling's and Draheim's cases does not reflect a complete disappearance of *Histoplasma* from Panama during that time. Tomlinson and Grocott's canine case reported in 1945 has already been mentioned. An accidental but very important discovery by Zimmerman of a human case of benign histoplasmosis helps to fill in a segment of the history. Reexamination with special

stains of a solitary pulmonary lesion in a 4-year-old Panamanian child dying in 1931 with another disease revealed *Histoplasma* in the necrotic center of the healed granuloma (13). It may be anticipated that further studies of similar material will yield evidence of additional unrecognized cases of benign histoplasmosis spanning this period when histoplasmosis was overlooked in the country where it was first observed and described.

I am well aware that to this point my historical review of histoplasmosis is familiar, that many severe cases of histoplasmosis have been recognized during the past 2 years in Panama, and that current interest in the mycosis has revealed many as yet unpublished facts about its frequency and importance there.

Status Today

Today histoplasmosis is known in some 22 countries of the world (14, 15), including highly sanitized as well as primitive areas. Histoplasmosis is not exclusively a disease of the tropics or of the United States, where it has been most intensively studied, nor is it a disease of unhygienic geographic areas in the usual connotation of that phrase. Neither is it a protozoan disease, nor a usually fatal disease as Darling supposed, but these are details in the delineation of the mycosis which detract little from the accuracy of its first description and not at all from the genius of the describer.

There have been many steps in the development of our current knowledge of histoplasmosis, but before I review some of these in chronological order, I want to mention another recent significant contribution from Panama. One of the diagnostic problems that benign histoplasmosis has presented is a nonspecific and often minimal host reaction and a paucity of fungus cells in minimal lesions. A histopathological diagnosis, consequently, has often been missed, particularly in old healed lesions where the fungus, presumably, is dead. A number of selective stains have been proposed and used with eminent success, but most of these stain old or dead cells poorly. The most useful stain for the demonstration of *Histoplasma* in old, quiescent and healed lesions is the modification of Gomori's methenamine-silver-nitrate tech-

nique as applied in the laboratories of Gorgas Hospital (formerly Ancon Hospital) and reported by Grocott (16). This modification, as he modestly states, does not supplant such stains as the periodic acid-Schiff and the Gridley stains, but it makes cells of *Histoplasma* and other fungi so conspicuous in the section of an old necrotic or partially calcified lesion that their demonstration no longer presents a serious problem.

Discoveries and developments leading to present concepts of histoplasmosis have been reviewed in many papers. Da Rocha-Lima's opinion (17), accepted by Darling according to Meleny (18), that *Histoplasma* was a fungus was fully verified in 1934 when Tompkins at Vanderbilt University made the first antemortem diagnosis of histoplasmosis by examination of a blood smear (19). DeMonbreun isolated in culture and described in great detail the growth of the fungus under varying environmental conditions (20). Hansmann and Schencken (21) isolated the fungus in the same year, but, because of certain clinical features observed in their patient, they did not immediately reach the diagnosis of histoplasmosis.

Year by year additional cases were reported until in 1945 Parsons and Zarafonitis (22) reviewed 71 cases, in only 4 of which the patient had survived to the time of report.

In the meantime an increasing mass of evidence indicated that, in certain geographic areas at least, a pulmonary disease generally assumed to be healed tuberculosis must have some other etiology (23-25). Smith (26), speaking from his experience with benign pulmonary coccidioidomycosis, suggested this might be a hitherto unrecognized form of histoplasmosis. Christie and Peterson (27, 28) observed an association between histoplasmin sensitivity and the presence of calcified pulmonary lesions in tuberculin negative individuals. Palmer, knowing of these observations, used histoplasmin prepared some time before in the Mycology Unit of the National Institutes of Health (29) in his well-known study of tuberculin and histoplasmin sensitivity in student nurses and found remarkable geographic differences in rates of histoplasmin sensitivity (30-32).

Furcolow and associates (33-35) described

the pulmonary lesions and traced the correlation between their development and the acquisition of skin sensitivity to histoplasmin. The nonspecificity of histoplasmin was known before it was used in any mass testing (29), and histoplasmin and yeast-phase *Histoplasma* antigens as used today have nonspecific components which limit their usefulness as diagnostic agents in both intradermal and serologic tests (36-40). Nevertheless, both uses have resulted in tremendous strides in our knowledge of the frequency of histoplasmosis.

These studies have revealed that histoplasmosis is usually benign, varying in severity from a clinically inapparent respiratory infection manifested only by the acquisition of skin sensitivity to a more severe pulmonary disease with cavitation. Pulmonary calcification is a frequent, but not an invariable, sequela of these mild and moderately severe cases. It is only in the exceptional case that histoplasmosis becomes disseminated and may terminate fatally.

More detailed reviews of the development of our knowledge of histoplasmosis and more extensive bibliographies are given in recent review papers (41-43). These papers review also the clinical variations of histoplasmosis, including manifestations not observed by Darling, such as involvement of the central nervous system, adrenal damage, and endocarditis. It is not my intention to dwell further upon the clinical aspects of histoplasmosis since these have been so fully and repeatedly covered in many case reports and review papers.

Laboratory Confirmation

Any reference to the clinical variability of histoplasmosis suggests the importance of a laboratory diagnosis. Laboratory confirmation of a clinical impression or diagnosis is indeed essential in this mycosis. Within limits, diagnostic antigens are useful in attempts to reach a diagnosis. These limitations are perhaps greater than in most bacterial diseases. Dermal sensitivity to histoplasmin persists for many years, and the rate of histoplasmin sensitivity within an endemic area may be so high that a skin reaction has little diagnostic value unless a recent conversion to sensitivity can be

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shown. Correlation of rising complement fixation or precipitin titers with an illness has greater diagnostic value than the skin test, but reactions to both histoplasmin and yeast-phase antigens must be interpreted with caution since it is well recognized that several of the pathogenic fungi have one or more antigens in common. Cross reactions with blastomycosis, coccidioidomycosis, or other mycoses may occur in some patients so that it is necessary in a serodiagnosis to obtain paired or multiple serums and to test these against a battery of fungus antigens. Campbell has very ably investigated the problems of the serologic diagnosis of histoplasmosis and has discussed techniques and the correct interpretation of results (36-38).

A more conclusive diagnostic procedure is the isolation of *Histoplasma* in culture and this should always be attempted. Sputum, blood, bone marrow, at least in infants, skin lesions, ulcer base, and lymph nodes, or pulmonary lesions obtained by surgical excision, should be spread upon agar slants and incubated at 23°-30° C. Many culture media have been used and their relative efficiency compared, but freshly prepared glucose-neopeptone agar (modified Sabouraud's) is convenient and adequate. When contaminated material such as sputum is used for inoculum, the agar should be made unsuitable for bacterial growth by the addition of 0.5 micrograms each of penicillin and streptomycin per milliliter of agar.

The mouse is highly susceptible to histoplasmosis (44, 45) and may be used for diagnosis by the intraperitoneal injection of sputum. Mice require protection against bacteria in the sputum inoculum, and this usually can be achieved by mixing penicillin and streptomycin with the sputum before injection or by subsequent treatment of the mice. More detailed information about diagnostic procedures is available in many papers.

Epidemiological Features

Histoplasmosis shares with the other deep mycoses an apparent inability to spread from person to person. The parasitic or tissue phase of the dimorphic fungus is infectious experimentally, but it is not an effective agent in transmission of the disease, and contagion of

histoplasmosis has not been observed. On the contrary, the patient, according to best evidence available, invariably acquires his infection from an environmental site where *Histoplasma* is growing as a saprophyte.

The infectious particles are the conidia or spores which are produced freely under suitable conditions. They are much more resistant to deleterious influences than the fragile yeast cells of the parasitic growth phase and are inhaled by the patient during the performance of activities which release these spores as airborne dust. This concept rests upon the evidence of many case histories, the demonstration that *Histoplasma* can be grown in the laboratory upon sterilized soil, the isolation of *Histoplasma* in culture from soil in nature, and the actual demonstration of the distinctive macroconidia of *Histoplasma* in soil naturally colonized by the fungus (46, 47).

Since all available evidence had suggested the importance of an environmental source of infection, the Mycology Laboratory of the National Institutes of Health began a systematic search for saprophytic sources of *Histoplasma* in 1946.

Histoplasma was first isolated from soil and reported in 1949 after some 350 specimens had been unsuccessfully examined. Macroconidia were observed in the first positive specimens (46). The first positive specimens were two samples of red clay taken from a mound of earth at the entrance to a rat burrow located under the edge of a chickenhouse where infected rats had previously been trapped.

This discovery was made while we were somewhat preoccupied with the possible importance of an animal reservoir and the fact that this, as well as many subsequent isolations of *Histoplasma* were from chickenhouses on farm premises where rats with histoplasmosis had been trapped, obscured at first the more important of the two associations. Zeidberg and co-workers (48) were first to point out the association between the saprophytic growth of *Histoplasma* in soil and the presence of chickens. Since this predilection of *Histoplasma* for enriched soil in or near chickenhouses has been recognized, it is now almost routine, within an endemic area, to isolate *Histoplasma* from such sites and often from a high percentage of sam-

ples. Many cases of histoplasmosis in man have been related to exposure to dust, incident to the cleaning of old or neglected chickenhouses. However, such an exposure has not been recognized in many other cases, and *Histoplasma* has been isolated from environments with no apparent relationship to chickens.

It should be recognized further that the frequent occurrence of *Histoplasma* in, under, or near chickenhouses is not dependent upon a host-parasite relationship to the chicken. No naturally infected chickens have been observed, and histoplasmosis cannot be produced experimentally in the chicken although the fungus can be isolated from tissues for a short time after intravenous inoculation. On the contrary this appears to be an entirely saprophytic relationship to enriched soil contaminated by chicken droppings and to other similarly suitable soils with high organic content.

Whether the apparent immunity of the chicken to histoplasmosis is simply a matter of the bird's high body temperature remains to be proved. Mammals, on the other hand, show a wide range of species susceptibility. DeMonbreun (49) observed histoplasmosis in the dog, and this animal still represents the only economically important host of histoplasmosis recognized in veterinary medicine (50). However, other animals are susceptible. We have isolated *Histoplasma* in culture from 9 other species: the cat, brown rat, roof rat, mouse, fox, opossum, striped skunk, spotted skunk, and marmot (51). Others have found the fungus in the horse and cow (52, 53). The histoplasmin skin test has been used widely in veterinary medicine (54).

Histoplasmosis, as observed in these animals, has been for the most part a very mild and probably a self-limited disease. We have observed the progressive and fatal form only in the dog although isolation of the fungus from spleen and liver provided evidence of dissemination in many of the cats, rats, skunks, and other animals examined. Our evidence does not show conclusively whether histoplasmosis is a frequent cause of death in wild animals. In the case of dogs and cats, we have conclusive evidence that histoplasmosis usually is benign and that it is an infrequent cause of death.

Because of a rabies control program conducted in a rural county in northern Virginia, we were able to get directly from their owners several hundred healthy dogs and cats. Using the most productive method of examination we could devise, the intraperitoneal injection of mice with homogenized hilar and mediastinal lymph nodes, we isolated *Histoplasma* by mouse passage from 50 percent of a series of cats and dogs (55, 56).

Since, in a study extending over a period of several years, we have found relatively few dogs with fatal histoplasmosis, we are forced to the conclusion that most of these healthy animals would have survived their primary infection, in most cases without clinical evidence of disease. We were not able to find a correlation between naturally acquired mild histoplasmosis in the dog, as proved by isolation of *Histoplasma* from lymph nodes, and either dermal or serologic evidence of infection (56). This lack of correlation could have been due to inadequacy of the antigens, to the mild and apparently self-limited nature of the disease, or to the varying and unknown duration of the disease in these naturally infected animals. It should be emphasized that, although histoplasmosis occurred in half of the dogs and cats in this particular endemic area, there is no evidence to support the concept that these animals are responsible for the endemicity of the mycosis. On the contrary, as pointed out above, the fungus, *Histoplasma capsulatum* is a part of the saprophytic soil microflora, and it is undoubtedly from this environmental source that both man and animals are infected.

Antibiotic Therapy

There is as yet little to report on the chemotherapy of histoplasmosis. Ascocin and mycostatin (57, 58) can be shown to protect experimentally infected mice against histoplasmosis, but toxicity or inability to attain effective blood levels, or both, have limited the clinical usefulness of these antibiotics. A new antibiotic which shows considerable promise is Amphotericin B (59). In experimentally infected mice, Amphotericin B will not only protect mice from death but will clear the tissues of fungi as indicated by negative cultures when

the experiment is terminated. Clinical experience with this antibiotic is still limited.

The number of publications on histoplasmosis now appearing annually is many times greater than all the medical literature on all the deep mycoses published during the 3 years while Darling was searching for what he believed to be a new type of leishmaniasis. Many of the questions concerning the etiology and epidemiology of histoplasmosis left unanswered by Darling have now been answered, but we still seek information about its geographic endemicity, its clinical variability, and, especially, its safe and effective treatment. It is appropriate that during recent years attention has again turned to the part of tropical America which, in a sense, was the cradle of histoplasmosis. The concerted attack upon histoplasmosis now anticipated here will surely be productive.

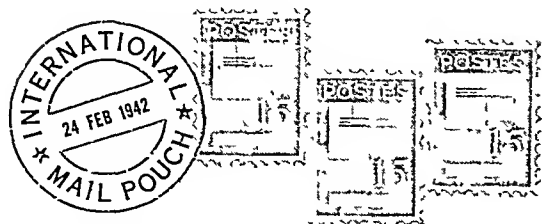
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Passing of a Practice

When three Chinese experts, a WHO adviser, and a sanitary engineer arrived in Japan from Taiwan for a 2-week tour of inspection, they found that more than a hundred cities were building sewer or sewage treatment systems. The team took for granted that this building was spurred by a desire to make night soil fertilization safe for public health. But they discovered that the Japanese Government had no program encouraging the use of night soil, although 2 systems for night soil treatment and 1 garbage composting plant are under construction. The death knell of this controversial, age-old practice was sounded by the progress of industrialization and education of farmers, by broadened access to chemical fertilizers, and by the modern policies of the Ministry of Health and Welfare, which were accepted by the Ministry of Agriculture.

—JOEL I. CONNELLY and A. DALE SWISHER, engineers, *United States Operations Mission, Taiwan*.

Anthrax Factories

Although Iran is not a highly industrialized country, industrial labor forms a noteworthy proportion of the population. Except for a few organizations such as the National Oil Company, management pays little heed to health requirements of the workers.

Recent reports on the prevalence of anthrax in some of the wool and hide factories caused us to have

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health conditions inspected. The health department physician assigned to the task reported that plant managers do not consider health matters of importance. The factory environment generally is insanitary. Some factories are without windows; the air is often foul and in most full of dust. Satisfactory lavatories are lacking in many plants.

—GLEN W. McDONALD, M.D., M.P.H., *chief, Public Health Division, United States Operations Mission, Iran*.

A Day to Remember

Not one villager in a hundred in Alamata, Ethiopia, had seen a movie before we scheduled a film show on malaria, in advance of operations to be carried out in the Kobo-Chercher plain, north of Addis Ababa. For electrical power for the movie, we carried a generator in our big truck, locally dubbed the "kudu wagon."

An hour before dark, the villagers began to gather around the projectors set up in the market place. The governor and head men, including invited guests from neighboring villages, arrived at dark and were ushered to the few available chairs.

As the first film strips were shown, the audience of 500 swelled to 800. They were all eyes and ears! Next on the program was a malaria movie, explained by an Ethiopian official speaking Amharic. Last, a film showed the Emperor on his 1954 visit to the United States. The response, Ethiopian team members assured us, meant that the villagers now had a new understanding of malaria and of what the strangers from America, working with their fellow countrymen, were trying to do.

—PAUL L. RICE, *entomologist, United States Operations Mission, Ethiopia*

California finds that when household survey data are adjusted to include information on patients who have died, hospital admissions are increased by 6 percent and hospital days by 10 percent.

Household Surveys for Hospital Planning: Adjustment for Decedents Missed

BETH M. SIEGEL, B.A., NEDRA B. BELLOC, M.A., and FRANK E. HESSE, M.D., M.P.H.

BECAUSE household surveys can be designed to describe general population groups within a specified range of sampling variation, they are being used increasingly to gather data on illness and medical care, including services provided by hospitals. Household survey data, however, are subject to a number of limitations. Important among these from the standpoint of data for use in planning hospital facilities is the usual exclusion of persons who have died during the period covered by the survey. If this period is the customary 1 year, rates of hospital use may be affected substantially by the omission of data for this group.

Information about persons who have died is seldom obtained in household surveys because it is difficult, if not impossible, to obtain a complete and unduplicated count of decedents. Many persons with terminal illness are elderly and live in one-person households. Such house-

holds are dissolved with the death of their solitary members, leaving no one of whom questions can be asked. Also, a household may be dissolved at the death of a parent or spouse, with several survivors moving to new households and constituting potential respondents.

Two recent surveys conducted by the California State Department of Public Health under research grants from the National Institutes of Health, Public Health Service, permit examination of the question of exclusion of decedents. The first was an exploratory study of methods conducted in San Jose in 1952 (1). By means of a check with hospital records, this survey demonstrated the validity of household interview reports of hospitalization (2). It also provided data on the actual hospital experience of residents of the city who died during the 1-year period covered by the survey. The second survey, conducted between May 1954 and April 1955, was a statewide effort to measure illness and use of medical services through interviews of about 10,000 households. It covered hospitalization during the previous 1-year period for the population living at the time of the interview.

In this paper, the San Jose data are compared with an estimate of hospital care for decedents used in a nationwide survey of persons aged 65 and over reported by Falk and Brew-

Mrs. Siegel is associate public health analyst, and Dr. Hesse is medical consultant, with the medical facilities planning section, bureau of hospitals, California Department of Public Health. Mrs. Belloc, now with the prevention of blindness project, California Department of Public Health, formerly was associate statistician for the San Jose survey.

Arthur Weissman, who directed the San Jose survey, assisted in preparing material for this paper.

Table 1. Number of admissions and days in local general hospitals for resident decedents,¹ by place of death, according to age and sex, San Jose, Calif., July 1, 1951–June 30, 1952

| Age and sex | Total | | | | | | Place of death | | | | | | | | |
|------------------------|--------|------------|-------|----------------------------|----------------------|----------------|-----------------------------|-------------------------|-------------------|--------------------------------|-------------------------|-------------------|--------------------|-------------------------|-------------------|
| | Deaths | Admissions | Days | Average days per admission | Admissions per death | Days per death | General or special hospital | | | Other institution ² | | | Not in institution | | |
| | | | | | | | Deaths | Admissions ³ | Days ³ | Deaths | Admissions ³ | Days ³ | Deaths | Admissions ³ | Days ³ |
| All ages..... | 984 | 623 | 9,833 | 15.8 | 0.63 | 10.0 | 463 | 527 | 8,480 | 124 | 31 | 695 | 397 | 65 | 658 |
| Male..... | 532 | 313 | 4,119 | 13.2 | .59 | 7.7 | 251 | 269 | 3,567 | 51 | 11 | 174 | 230 | 33 | 378 |
| Female..... | 451 | 310 | 5,714 | 18.4 | .69 | 12.7 | 212 | 258 | 4,913 | 73 | 20 | 521 | 166 | 32 | 280 |
| 0-14 years..... | 69 | 24 | 461 | 19.2 | .35 | 6.7 | 53 | 23 | 453 | 3 | 1 | 8 | 13 | 0 | 0 |
| Male..... | 40 | 11 | 139 | 12.6 | .28 | 3.5 | 29 | 10 | 131 | 3 | 1 | 8 | 8 | 0 | 0 |
| Female..... | 29 | 13 | 322 | 24.8 | .45 | 11.1 | 24 | 13 | 322 | 0 | 0 | 0 | 5 | 0 | 0 |
| 15-64 years..... | 328 | 241 | 3,535 | 14.7 | .73 | 10.8 | 162 | 217 | 3,241 | 24 | 1 | 36 | 142 | 23 | 258 |
| Male..... | 204 | 127 | 1,457 | 11.5 | .62 | 7.1 | 91 | 112 | 1,311 | 14 | 0 | 0 | 99 | 15 | 146 |
| Female..... | 124 | 114 | 2,078 | 18.2 | .92 | 16.8 | 71 | 105 | 1,930 | 10 | 1 | 36 | 43 | 8 | 112 |
| 65 years and over..... | 586 | 358 | 5,837 | 16.3 | .61 | 10.0 | 248 | 287 | 4,786 | 97 | 29 | 651 | 241 | 42 | 400 |
| Male..... | 287 | 175 | 2,523 | 14.4 | .61 | 8.8 | 130 | 147 | 2,125 | 34 | 10 | 166 | 123 | 18 | 232 |
| Female..... | 299 | 183 | 3,314 | 18.1 | .61 | 11.1 | 118 | 140 | 2,661 | 63 | 19 | 485 | 118 | 24 | 168 |

¹ All deaths, including those of the newborn, of persons whose residence was given as San Jose on the death certificate.

² Mental hospital, tuberculosis hospital, nursing home, correctional or other institution.

³ A death may have occurred in a hospital or elsewhere in or outside San Jose, but hospital admissions and days include only those in the 4 general hospitals

in or immediately adjacent to the city of San Jose (San Jose Community Hospital, O'Connor Hospital, Doctors Hospital, Santa Clara County Hospital).

⁴ Includes 1 death of unknown age.

NOTE: Admissions and days include 1-day stays not overnight and exclude hospitalization of the newborn.

SOURCE: San Jose survey, bureau of chronic diseases, California State Department of Public Health.

ster (3). Also, these data are used to adjust the data obtained in the California health survey.

San Jose Survey

In addition to a household survey and an investigation of other sources of information, the San Jose study included examination of (a) the hospital medical records of all the city's residents who received care in any of the four local general hospitals between July 1, 1951, and June 30, 1952, and (b) the death certificates for all city residents who died in the same period. There were 10,014 hospital records and 984 deaths. The hospital records were abstracted and matched with the death certificates. In this manner the actual hospital experience of decedents was obtained.

Only hospitalization during the year covered

in the survey was included in the data for decedents. A person who died in the hospital on July 2, 1951, for example, was counted as having 1 period of hospitalization lasting 1 day.

The San Jose findings are subject to the major limitation of not including any hospital care that may have been received in other communities. This characteristic undoubtedly results in an understatement of hospitalization, particularly for males aged 15-64, who probably used Veterans Administration hospitals and an industrial hospital outside San Jose.

The San Jose data are derived from hospital records and include 1-day stays not overnight. Such stays are specifically excluded from the California health survey. In the San Jose survey, 1-day stays not overnight amounted to 43 percent of all 1-day stays and 7 percent of all admissions. They represented less than 1 per-

cent of the total hospital days. Counts by age, sex, or other characteristics are not available.

Hospitalization data for the 984 persons in San Jose who died during the period covered by the survey are given in table 1. These persons had 623 hospital admissions, one-fourth of which were nonterminal, and they used 9,833 hospital days.

Comparison With Falk-Brewster Method

In their report on hospitalization for persons aged 65 and over, Falk and Brewster drew attention to the problem of omission of decedents. They estimated the amount of care used by this group and found that its addition to household survey findings increased rates of utilization by approximately one-fourth (fig. 1).

Falk and Brewster estimated hospital experience for decedents by applying assumed hospital admission rates to counts of persons dying. For those dying in hospitals, they figured that each death equaled one admission. For those dying in other institutions, they assumed that there were no admissions, reasoning that these persons make negligible use of hospitals. For persons dying outside institutions, they divided the number in half (since persons dying in 1 year have lived on the average for one-half a year) and applied the admission rates of the household survey population. They determined the number of hospital days by multiplying the estimated number of admissions for each group of decedents by the average length of stay for the household survey population.

The one-fourth increase in rates obtained by this method indicates that, at least in the age group 65 and over, omission of decedents creates a large underestimate. A comparison between

Table 2. Comparison of estimated and actual hospital experience for decedents aged 65 years and over, San Jose, Calif., July 1, 1951-June 30, 1952

| Place of death | Number of deaths | Estimated hospital experience (Falk-Brewster method applied to San Jose data) | | Actual local general hospital experience (hospital record data) | |
|----------------------------------|------------------|---|-------------------|---|--------------------|
| | | Admissions | Days ¹ | Admissions | Days |
| All places----- | 586 | 258 | 4,876 | ² 333 | ² 5,812 |
| General or special hospital----- | 248 | 248 | 4,687 | ² 262 | ² 4,761 |
| Other institution-- | 97 | 0 | 0 | 29 | 651 |
| Not in institution-- | 241 | ³ 10 | 189 | 42 | 400 |

¹ Estimated admissions multiplied by 18.9 days, the average length of stay for persons aged 65 years and over found in household interview part of San Jose survey.

² Excludes an estimated 25 admissions and 25 days for 1-day stays not overnight, derived by applying San Jose finding of 7 percent to actual total of 358 admissions.

³ Based on admission rates for persons aged 65 years and over found in household interview part of San Jose survey: Males, 8.9 percent; females, 7.6 percent.

SOURCE: San Jose survey, bureau of chronic diseases, California State Department of Public Health.

Figure 1. Falk-Brewster adjustment of annual hospital utilization rates, 1952: admissions and days per 1,000 persons, aged 65 years and over.

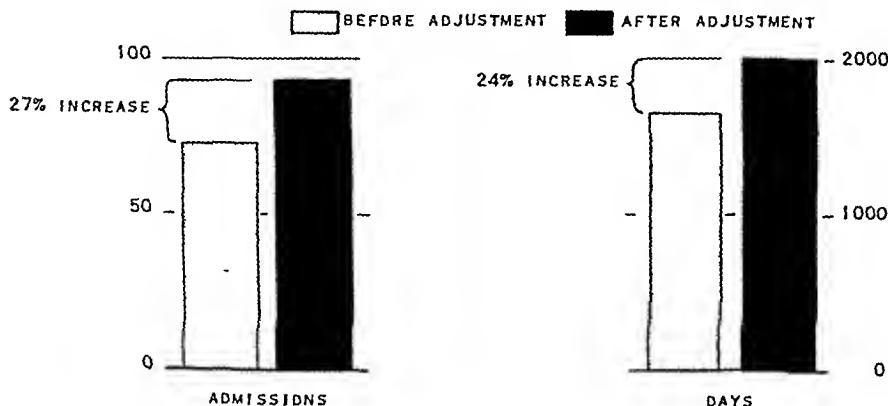


Table 1. Number of admissions and days in local general hospitals for resident decedents,¹ by place of death, according to age and sex, San Jose, Calif., July 1, 1951-June 30, 1952

| Age and sex | Total | | | | | | Place of death | | | | | | | | |
|------------------------|--------|------------|-------|----------------------------|----------------------|----------------|-----------------------------|-------------------------|-------------------|--------------------------------|-------------------------|-------------------|--------------------|-------------------------|-------------------|
| | Deaths | Admissions | Days | Average days per admission | Admissions per death | Days per death | General or special hospital | | | Other institution ² | | | Not in institution | | |
| | | | | | | | Deaths | Admissions ³ | Days ³ | Deaths | Admissions ³ | Days ³ | Deaths | Admissions ³ | Days ³ |
| All ages..... | 984 | 623 | 9,833 | 15.8 | 0.63 | 10.0 | 463 | 527 | 8,480 | 124 | 31 | 695 | 397 | 65 | 658 |
| Male..... | 532 | 313 | 4,119 | 13.2 | .59 | 7.7 | 251 | 269 | 3,567 | 51 | 11 | 174 | 230 | 33 | 378 |
| Female..... | 451 | 310 | 5,714 | 18.4 | .69 | 12.7 | 212 | 258 | 4,913 | 73 | 20 | 521 | 166 | 32 | 280 |
| 0-14 years..... | 69 | 24 | 461 | 19.2 | .35 | 6.7 | 53 | 23 | 453 | 3 | 1 | 8 | 13 | 0 | 0 |
| Male..... | 40 | 11 | 139 | 12.6 | .28 | 3.5 | 29 | 10 | 131 | 3 | 1 | 8 | 8 | 0 | 0 |
| Female..... | 29 | 13 | 322 | 24.8 | .45 | 11.1 | 24 | 13 | 322 | 0 | 0 | 0 | 5 | 0 | 0 |
| 15-64 years..... | 328 | 241 | 3,535 | 14.7 | .73 | 10.8 | 162 | 217 | 3,241 | 24 | 1 | 36 | 142 | 23 | 258 |
| Male..... | 204 | 127 | 1,457 | 11.5 | .62 | 7.1 | 91 | 112 | 1,311 | 14 | 0 | 0 | 99 | 15 | 146 |
| Female..... | 124 | 114 | 2,078 | 18.2 | .92 | 16.8 | 71 | 105 | 1,930 | 10 | 1 | 36 | 43 | 8 | 112 |
| 65 years and over..... | 586 | 358 | 5,837 | 16.3 | .61 | 10.0 | 248 | 287 | 4,786 | 97 | 29 | 651 | 241 | 42 | 400 |
| Male..... | 287 | 175 | 2,523 | 14.4 | .61 | 8.8 | 130 | 147 | 2,125 | 34 | 10 | 166 | 123 | 18 | 232 |
| Female..... | 299 | 183 | 3,314 | 18.1 | .61 | 11.1 | 118 | 140 | 2,661 | 63 | 19 | 485 | 118 | 24 | 168 |

¹ All deaths, including those of the newborn, of persons whose residence was given as San Jose on the death certificate.

² Mental hospital, tuberculosis hospital, nursing home, correctional or other institution.

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NOTE: Admissions and days include 1-day stays not overnight and exclude hospitalization of the newborn.

SOURCE: San Jose survey, bureau of chronic diseases, California State Department of Public Health.

ster (3). Also, these data are used to adjust the data obtained in the California health survey.

San Jose Survey

In addition to a household survey and an investigation of other sources of information, the San Jose study included examination of (a) the hospital medical records of all the city's residents who received care in any of the four local general hospitals between July 1, 1951, and June 30, 1952, and (b) the death certificates for all city residents who died in the same period. There were 10,014 hospital records and 984 deaths. The hospital records were abstracted and matched with the death certificates. In this manner the actual hospital experience of decedents was obtained.

Only hospitalization during the year covered

in the survey was included in the data for decedents. A person who died in the hospital on July 2, 1951, for example, was counted as having 1 period of hospitalization lasting 1 day.

The San Jose findings are subject to the major limitation of not including any hospital care that may have been received in other communities. This characteristic undoubtedly results in an understatement of hospitalization, particularly for males aged 15-64, who probably used Veterans Administration hospitals and an industrial hospital outside San Jose.

The San Jose data are derived from hospital records and include 1-day stays not overnight. Such stays are specifically excluded from the California health survey. In the San Jose survey, 1-day stays not overnight amounted to 43 percent of all 1-day stays and 7 percent of all admissions. They represented less than 1 per-

Table 4. Number of admissions and days per 1,000 persons per year and average length of stay in general hospitals, according to age and sex: California health survey data unadjusted and adjusted to include experience of decedents ¹

| Age and sex | Admissions | | | Days | | | Days per admission | | | For 95 percent confidence level plus or minus the following percent of the unadjusted rate ² | |
|----------------------|------------------------|-----------|------------------|------------------------|-----------|------------------|--------------------|-----------|----------------|---|------|
| | Rate per 1,000 persons | | Percent increase | Rate per 1,000 persons | | Percent increase | | | | | |
| | Unad-justed | Ad-justed | | Unad-justed | Ad-justed | | Unad-justed | Ad-justed | Percent change | Admis-sions | Days |
| All ages..... | 93 | 99 | 6 | 881 | 969 | 10 | 9.5 | 9.8 | +3 | 5 | 12 |
| Male..... | 70 | 76 | 9 | 968 | 1,050 | 8 | 13.8 | 13.8 | 0 | 8 | 18 |
| Female..... | 114 | 119 | 4 | 798 | 892 | 12 | 7.0 | 7.5 | +7 | 8 | 18 |
| 0-14 years..... | 41 | 42 | 2 | 229 | 247 | 8 | 5.6 | 5.9 | +5 | 17 | 27 |
| Male..... | 46 | 47 | 2 | 286 | 296 | 3 | 6.2 | 6.3 | +2 | 21 | 39 |
| Female..... | 35 | 36 | 3 | 169 | 194 | 15 | 4.8 | 5.4 | +12 | 21 | 35 |
| 15-44 years..... | 123 | 124 | 1 | 1,000 | 1,021 | 2 | 8.1 | 8.2 | +1 | 8 | 25 |
| Male..... | 63 | 65 | 3 | 1,027 | 1,046 | 2 | 16.3 | 16.1 | -1 | 15 | 34 |
| Female..... | 176 | 177 | 1 | 976 | 997 | 2 | 5.5 | 5.6 | +2 | 10 | 22 |
| 45-64 years..... | 98 | 106 | 8 | 1,151 | 1,272 | 10 | 11.7 | 12.0 | +3 | 8 | 16 |
| Male..... | 101 | 111 | 10 | 1,451 | 1,563 | 8 | 14.4 | 14.1 | -2 | 16 | 28 |
| Female..... | 94 | 101 | 7 | 862 | 991 | 15 | 9.2 | 9.8 | +7 | 16 | 23 |
| 65 years and over... | 109 | 146 | 34 | 1,900 | 2,493 | 31 | 17.4 | 17.1 | -2 | 15 | 33 |
| Male..... | 121 | 162 | 34 | 2,018 | 2,609 | 29 | 16.7 | 16.1 | -4 | 24 | 48 |
| Female..... | 98 | 131 | 34 | 1,792 | 2,386 | 33 | 18.3 | 18.2 | -1 | 24 | 47 |

¹ California health survey covered hospitalization in both Federal and non-Federal hospitals for the non-institutional population living off military posts. The interview period was May 1954-April 1955 covering hospitalization in prior 12-month periods. Hospitalization of newborn is excluded. The adjusted rates underestimate male utilization more than female utilization because this was true of the San Jose ratios used in the adjustment.

² Twice the estimated coefficient of variation. The chances are 95 out of 100 that the percentage difference between the sample survey findings and the results of a complete census of the population would be within twice the coefficient of variation.

SOURCE: California health survey, bureau of chronic diseases, California State Department of Public Health.

days by 10 percent. For persons aged 65 and over, who are the majority of the decedents, the adjustment increased the rates of both admissions and days by about one-third (fig. 2).

Unlike rates of admissions and days, average length of stay is not necessarily increased by adjustment for persons who have died. This adjustment of the California health survey data decreases average stay for the age group 65 and over and increases average stay for all other age groups. The changes are all relatively small. Whether the data reflect real changes cannot be determined because the differences are smaller than sampling fluctuations at the 95-percent confidence level.

In connection with planning medical facilities under the Hospital Survey and Construc-

tion Act (Hill-Burton program), there is considerable interest in bed-population ratios for non-Federal hospitals. These ratios as derived from the California health survey, both unadjusted and adjusted to include experience of decedents, are shown in table 5. The adjustment increases the bed-population ratio from 2.8 to 3.1 beds per 1,000 population of all ages and from 6.9 to 9.2 for the age group 65 and over. From reports submitted to the California State Department of Public Health by hospitals and on information from its field staff, an average of approximately 3 general hospital beds for acutely ill patients per 1,000 population is known to be in actual use in California. In 1956 the State adopted this ratio as the minimum for planning under the Hospital Survey and Construction Act (4).

the actual hospital experience for 586 San Jose decedents aged 65 and over and an estimated experience calculated according to the method of Falk and Brewster indicates that the discrepancy caused by the omission of decedents is even larger (table 2). The Falk-Brewster method gave an estimate of 258 admissions and 4,876 days, whereas there were actually (subtracting an estimated twenty-five 1-day stays not overnight) 333 admissions and 5,812 days. The difference results partly from the failure to allow for multiple admissions of persons who died in general hospitals, partly from the fact that no allowance was made for prior admissions to general hospitals for persons who died in other institutions, and partly from the underestimation of admissions for those who died outside institutions.

Adjustment of Statewide Data

To estimate the total annual use of general hospitals in California, the San Jose data were

used to adjust the findings of the California health survey. Although a respondent in the California health survey might have died on the day following the interview, only his experience as a survivor of the past 12 months was included in the household survey rates. During any one year hospitals also provided care to persons who failed to survive the 12 months. These persons had lived, on the average, for 6 months. Their hospital experience during the part of the year they lived was missed in the California health survey.

The age-sex-specific ratios (admissions and days per death) found for the San Jose decedents were applied to the deaths in each age-sex group reported for the State in 1954 to obtain estimated rates of admissions and days (table 3). These rates were then applied to the data obtained in the California health survey to obtain adjusted rates of admissions and days (table 4).

For all ages, the adjustment of the California health survey data increased the estimate of hospital admissions by 6 percent and hospital

Table 3. Estimated number of admissions and days in non-Federal general hospitals for decedents in California, according to age and sex, 1954

| Age and sex | California deaths, 1954 ¹ | Ratios found in San Jose | | Estimated number | | Estimated rate per 1,000 persons ² | |
|------------------------|--------------------------------------|--------------------------|----------------|------------------|-----------|---|------|
| | | Admissions per death | Days per death | Admissions | Days | Admissions | Days |
| All ages..... | ³ 109,402 | ----- | ----- | 68,800 | 1,072,100 | 6 | 88 |
| Male..... | ³ 63,662 | ----- | ----- | 37,300 | 486,900 | 6 | 82 |
| Female..... | ³ 45,740 | ----- | ----- | 31,500 | 585,200 | 5 | 93 |
| 0-14 years..... | 9,307 | ----- | ----- | 3,300 | 62,400 | 1 | 18 |
| Male..... | 5,386 | 0.28 | 3.5 | 1,500 | 18,900 | 1 | 10 |
| Female..... | 3,921 | .45 | 11.1 | 1,800 | 43,500 | 1 | 25 |
| 15-44 years..... | 10,054 | ----- | ----- | 7,300 | 106,500 | 1 | 21 |
| Male..... | 6,437 | .62 | 7.1 | 4,000 | 45,700 | 2 | 19 |
| Female..... | 3,617 | .92 | 16.8 | 3,300 | 60,800 | 1 | 22 |
| 45-64 years..... | 29,688 | ----- | ----- | 21,400 | 307,700 | 8 | 121 |
| Male..... | 19,695 | .62 | 7.1 | 12,200 | 139,800 | 10 | 112 |
| Female..... | 9,993 | .92 | 16.8 | 9,200 | 167,900 | 7 | 129 |
| 65 years and over..... | 60,306 | ----- | ----- | 36,800 | 595,500 | 37 | 593 |
| Male..... | 32,105 | .61 | 8.8 | 19,600 | 282,500 | 41 | 591 |
| Female..... | 28,201 | .61 | 11.1 | 17,200 | 313,000 | 33 | 594 |

¹ By place of residence.

² Adjustment factor; based on population estimates of the California health survey.

³ Includes 39 male and 8 female deaths of unknown age.

Sources: San Jose survey, bureau of chronic diseases, and death records, California State Department of Public Health.

Table 5. Non-Federal general hospital beds used per 1,000 population per year, according to age and sex: California health survey data unadjusted and adjusted to include experience of decedents¹

| Age and sex | Beds per 1,000 persons at 70 percent occupancy ² | | |
|------------------------|---|----------|-------------------------------|
| | Unad-justed | Adjusted | Percent increase ³ |
| All ages----- | 2.8 | 3.1 | 12 |
| Male----- | 2.7 | 3.0 | 12 |
| Female----- | 2.9 | 3.3 | 12 |
| 0-14 years----- | .9 | .9 | 7 |
| Male----- | 1.1 | 1.2 | 4 |
| Female----- | .6 | .7 | 16 |
| 15-44 years----- | 2.8 | 2.9 | 3 |
| Male----- | 2.1 | 2.2 | 3 |
| Female----- | 3.4 | 3.5 | 3 |
| 45-64 years----- | 3.8 | 4.3 | 13 |
| Male----- | 4.4 | 4.9 | 10 |
| Female----- | 3.2 | 3.7 | 16 |
| 65 years and over----- | 6.9 | 9.2 | 34 |
| Male----- | 6.8 | 9.1 | 34 |
| Female----- | 6.9 | 9.3 | 34 |

¹ The interview period was May 1954-April 1955 covering hospitalization in prior 12-month periods. Hospitalization of newborn is excluded. The adjusted rates underestimate male utilization more than female utilization because this was true of the San Jose ratios used in the adjustment.

² Days of care in non-Federal general hospitals per 1,000 persons divided by 256 (70 percent of 365). Average occupancy in California non-Federal general hospitals is 70 percent.

³ Calculated from bed occupancy rates with two decimal places.

SOURCE: California health survey, bureau of chronic diseases, California State Department of Public Health.

pected statewide during the period covered by the California health survey.

5. The estimate derived from San Jose experience is conservative since it excludes hospitalization of residents outside the local community.

6. The adjustment using San Jose ratios brings the estimate of total hospitalization based on the California health survey data into closer agreement with data from other sources, as shown in table 7.

Other Approaches to the Problem

The San Jose data measure the general magnitude of the effect on hospitalization rates of

the omission of decedents in household surveys, and we believe they give an adequate, conservative adjustment of the California health survey data. However, there is need to develop better methods for overcoming limitations due to the omission of persons who have died. Ratios existing in one community during one year cannot be applied with confidence to future years or to the Nation as a whole. Another consideration is that omission of decedents affects findings on illness, disability, and other items as well as findings on hospital use.

One approach to the problem is to supplement the household survey with a study of a sample of deaths. Death certificates provide what can be considered a complete universe and are easily sampled. A more difficult problem is how to obtain the additional information on hospital care and perhaps on other subjects.

By mail or by interview, information might be obtained from the physician certifying the death, from the informant named on the death certificate, or from the hospital or institution where the death occurred. Further information might be obtained by followup of these sources. All these methods should be tried and evaluated.

Table 6. Percentage of population according to age and sex, San Jose, October 1952, and California, May 1954-April 1955

| Age and sex | San Jose | California |
|------------------------|----------|------------|
| All ages----- | 100 | 100 |
| Male----- | 47 | 49 |
| Female----- | 53 | 51 |
| 0-14 years----- | 24 | 29 |
| Male----- | 12 | 15 |
| Female----- | 12 | 14 |
| 15-44 years----- | 44 | 42 |
| Male----- | 20 | 20 |
| Female----- | 24 | 22 |
| 45-64 years----- | 22 | 21 |
| Male----- | 11 | 10 |
| Female----- | 11 | 11 |
| 65 years and over----- | 10 | 8 |
| Male----- | 4 | 4 |
| Female----- | 6 | 4 |

SOURCES: U. S. Bureau of the Census, Current Population Reports, series P-28, No. 464, October 24, 1952; California health survey, bureau of chronic diseases, California State Department of Public Health.

Note on Institutional Population

Both the study reported by Falk and Brewster and the California health survey were concerned primarily with the noninstitutional population. However, the institutional population uses general hospital care (table 2) and cannot be ignored in estimating total annual admissions and days.

Since the San Jose ratios include use of general hospitals by the institutional population that dies, the adjustment of the California health survey makes allowance for this group. The adjustment, however, does not make allowance for the institutional population that survives. The California health survey included a small sample of the surviving institutional population, but at the time this paper was written this sample had not been tabulated and analyzed.

Validity of the Adjustment

It is recognized that the San Jose ratios represent the experience of only one community. Their application to the United States is questionable. For persons aged 65 and over, Falk and Brewster reported that 31 percent die in general and special hospitals in the United States, whereas the figure for San Jose residents in this age group is 42 percent. The San

Jose ratios, however, are considered applicable to the California health survey data for the following reasons:

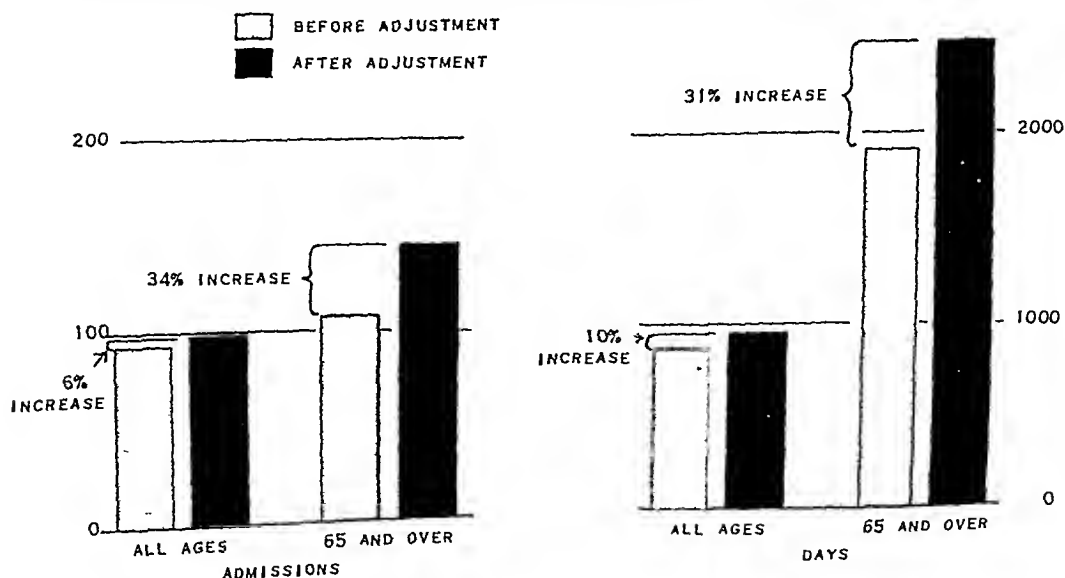
1. The San Jose information is the only information known to us on the actual hospital experience of decedents which includes non-terminal care and is also related to a general population.

2. Although no one city can be considered typical of the State, San Jose corresponds to the State in a number of respects. The age and sex composition is similar (table 6). The 1950 census showed no important differences between the population of San Jose and the total population of the State except that the city had a higher proportion of persons with Spanish surnames and a smaller proportion of Negroes.

3. San Jose in 1951-52 and California in 1955 had similar proportions of deaths occurring in hospitals and institutions. For all ages and for persons aged 65 and over, the figure was approximately 60 percent. (California data by age are not available for earlier years, nor do California data separate deaths in general hospitals from deaths in other institutions.)

4. Knowledge of local hospital practices and the little existing comparable data indicate that the type of hospital care available in San Jose in 1951-52 was similar to what might be ex-

Figure 2. Adjustment of annual hospital utilization rates obtained from the California health survey, 1953-55: admissions and days per 1,000 persons, all ages and 65 years and over.



names and addresses of any hospitals in which the decedent spent one or more days during the year of death.

3. Check with the hospitals named to verify the information and to obtain additional data on such items as number of days and treatment received.

Another approach to the problem is prospective study of the surveyed population to determine which persons die in the 12 months following interview and the amount of hospitalization used by these persons during that period. This is not an efficient method if its only purpose is to adjust data on hospital use. However, in California the method is under consideration for other purposes and may incorporate a test of the San Jose ratios. The major disadvantages of the method are (a) a small sample of deaths, (b) a relatively costly followup to locate informants and obtain the desired data, and (c) a later time period from the period covered in the household survey.

Summary and Conclusions

From hospital records, the actual hospital experience (in the four local general hospitals) of the 984 residents of San Jose, Calif., who died in the fiscal year 1952 was determined. This information was used to adjust the findings of the 1954-55 California health survey, a statewide household survey covering the living population.

For all ages the adjustment increased the estimate of hospital admissions by 6 percent

and the estimate of hospital days by 10 percent. For persons aged 65 years and over, the adjustment increased both the rate of admissions and the rate of days in the hospital by approximately one-third.

From this study, it is evident that persons who die during a 1-year period use hospital care during that period in amounts too great to be ignored in planning medical facilities. If household survey findings are to be used to describe the total amount of services provided by hospitals, it is necessary to add the experience of persons who have died.

Adjustment of the California health survey data on the basis of the San Jose data appears to give a reasonable estimate of total annual use of general hospitals in California for the period studied. However, further study is needed to test the accuracy of this adjustment and also to develop methods of adjustment that would be applicable whenever household surveys are done.

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- (1) Weissman, A.: California morbidity research project. *Am. J. Pub. Health* 42: 711-716, June 1952.
- (2) Belloc, N. B.: Validation of morbidity survey data by comparison with hospital records. *J. Am. Statist. A.* 49: 832-846, December 1954.
- (3) Falk, I. S., and Brewster, A.: Hospitalization insurance and hospital utilization among aged persons: March 1952 survey. *Soc. Security Bull.* 15: 3-17, November 1952.
- (4) California State Department of Public Health: *Hospitals for California*. Berkeley, Calif., 1956.

Footnote on Asian Influenza

A report of Asian influenza affecting 2,770 recruits and more than 70 percent of the crew of a naval vessel at San Diego appeared in the September 1957 issue of *Public Health Reports*, page 769.

The vessel had not been to the Far East or to any other foreign area. It is reported that the infection was present in San Diego before the ship left the port on June 6, 1957.

For data on hospital use, we have decided that the following method probably will be the most accurate and also the most feasible, at least for a special study in California:

1. Enlist the cooperation of a sample of local registrars of death (health officers), who in turn will obtain the cooperation of funeral directors.

For most California deaths the funeral director obtains information for the death certificate from the family and, for hospital deaths, communicates with the attending physician and with the hospital.

2. At the time the death certificate is prepared, have the funeral director obtain the

Table 7. Number of admissions and days per year in non-Federal general hospitals in California: comparison of findings from three sources

| Source | Admissions | | Days | | Definitions |
|---|-------------|--|--------------|--|--|
| | Number | Rate per 1,000 population ¹ | Number | Rate per 1,000 population ¹ | |
| California health survey (interview period May 1954-April 1955 covering hospitalization for May 1953-April 1955): | | | | | |
| Unadjusted..... | 1, 048, 000 | ² 86 | 8, 737, 000 | ³ 713 | Care reported in (a) community ⁴ hospitals classified as general or maternity in the list of hospitals licensed by the California Department of Public Health and (b) county and city hospitals. Excludes care of persons with no usual place of residence outside an institution. This probably excludes all of the domiciliary care and a large but unknown proportion of the long-term chronic and nursing care given by county hospitals. |
| Adjusted to include estimated care to decedents. | 1, 117, 000 | 92 | 9, 809, 000 | 801 | |
| Adjusted to include estimated care to decedents and estimated 1-day stays not overnight. ⁵ | 1, 201, 000 | 98 | 9, 893, 000 | 808 | |
| Bureau of hospitals, California State Department of Public Health (1954 for community ⁴ hospitals; 1954-55 for county and city hospitals). | 1, 425, 089 | 116 | 9, 629, 301 | 786 | Includes all non-Federal general and special ⁶ hospitals in California. Within these hospitals excludes services in beds assigned for tuberculosis, psychiatric, chronic, nursing, and domiciliary care. |
| American Hospital Association (year ending September 30, 1954). | 1, 258, 790 | 103 | 10, 573, 320 | 863 | Includes non-Federal short-term general and special ⁶ hospitals listed by the American Hospital Association in the Administrators Guide Issue, August 1955. Within these hospitals includes services in beds assigned for tuberculosis, psychiatric, chronic, nursing, and domiciliary care. |

¹ Rates based on population estimate of California health survey (12,250,000 resident noninstitutional population exclusive of persons living on military posts).

² Plus or minus 5 percent, twice the estimated coefficient of variation.

³ Plus or minus 12 percent, twice the estimated coefficient of variation.

⁴ Proprietary, nonprofit, and district hospitals plus University of California Hospital (State).

⁵ One-day stays not overnight are estimated to be 84,000 admissions and days, based on San Jose finding that 93 percent of admissions were overnight or longer.

⁶ Excludes tuberculosis and mental hospitals.

names and addresses of any hospitals in which the decedent spent one or more days during the year of death.

3. Check with the hospitals named to verify the information and to obtain additional data on such items as number of days and treatment received.

Another approach to the problem is prospective study of the surveyed population to determine which persons die in the 12 months following interview and the amount of hospitalization used by these persons during that period. This is not an efficient method if its only purpose is to adjust data on hospital use. However, in California the method is under consideration for other purposes and may incorporate a test of the San Jose ratios. The major disadvantages of the method are (a) a small sample of deaths, (b) a relatively costly followup to locate informants and obtain the desired data, and (c) a later time period from the period covered in the household survey.

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Health Officers' Meeting On Asian Influenza

A MEETING of State and Territorial health officers, called by Surgeon General Leroy E. Burney to discuss Asian influenza, was held on August 27-28, 1957, in Bethesda, Md., and Washington, D. C.

Participating members divided into committees to discuss major aspects of the problem and to develop recommendations and guidelines. Certain of their recommendations are briefed in the following paragraphs.

Collection of Specimens

In the identification of an outbreak, throat washings and serum should be submitted from at least 12 clinical cases, accompanied by clinical abstract and data on how specimens were taken. The specimens should be gathered in the face of an explosive outbreak of upper respiratory illness within the first 3 days of illness and submitted through the State health authority.

Epidemic Surveillance

Epidemic investigation of influenza should include, but not be limited to, the symptoms, etiology (by laboratory confirmation of the representative sampling), complications, mortality, and the age groups involved.

States should plan to gather intelligence rapidly regarding the occurrence of pneumonia. Since bacterial identification by sputum specimens is as important as virus diagnosis, it is further recommended that sputum specimens for bacterial studies and antibiotic sensitivity be taken as soon as pneumonia is suspected. The pneumonia rate in the extremes of age should be used as a sensitive index to assess the severity of an epidemic.

National Reporting System

Each State should submit a weekly situation report to the Public Health Service for operational purposes. This information can be added to the usual weekly telegram to the National Office of Vital Statistics.

States should adopt a program of epidemic reporting by counties to the States and then on

to the Public Health Service; a standard method of gathering and reporting information on outbreaks; and a method of sampling absentee rates in selected schools and industries. To facilitate analysis of data and to aid local, State, and national management of the epidemic, States are urged to participate in the proposed Public Health Service reporting programs.

The Committee on Epidemic Intelligence, a subcommittee of the State and Territorial Health Officers Association, working with the Communicable Disease Center, has developed a number of proposed forms for the collection of information. These are available from the Communicable Disease Center. Every State health officer should get these forms and see how they can be applied to his own State and local communities.

Technical Assistance

Assistance from the Public Health Service in support of virus laboratories and State health departments should include provision of diagnostic material; training of laboratory personnel; and loan of epidemiological personnel if requested by the State.

The Public Health Service could also assist the States by planning for regional conferences concerning epidemic progress if needed.

Community Planning

The health officer should estimate the possible effect of an epidemic on his community and determine current or potential resources to meet the problems which may be created, keeping in mind the following:

1. *Prevention*, an immunization program to stop the spread of infection.
2. *Care of a patient and his family*, including (a) medical and nursing care of the patient in the home, (b) hospitalization of complicated or other special cases, and (c) home-making and feeding programs in households where the mother is a patient or all members of the household are ill at the same time.
3. *Serious disruption of essential community services*, including public safety, police and fire, public utilities, light, power, and telephones and transportation.

On the basis of these considerations, he should outline a plan for his community in cooperation with the medical society. The next step would be to bring into the campaign other community groups concerned or which have resources that might be useful. If a well-organized, effectively operating voluntary health council exists in the community, this probably would be the group. If not, a special ad hoc committee should be established, which may be the basis for a continuing local health council.

The health officer should confine his activities to those for which he is legally responsible. As to other essential community services, he should advise the head of his department of the possible effects on such services, so that the head of his government can take the steps that will assure a minimum disruption of community life. The health officer should stand ready to advise and act on the health aspects of community problems precipitated by the epidemic and referred to him by other existing governmental agencies.

This guideline also applies to the State health officer and State services and organizations.

Public Gatherings

There is no practical advantage in the closing of schools or the curtailment of public gatherings. However, in some instances there may be administrative reasons for closing schools due to illness of teachers, bus drivers, large absentee rates, and so forth.

Use of Local Resources

Each community is urged to make full use of local facilities and services, such as home nursing service, homemakers service, first aid and care of the sick, to supplement the care needed for ill persons in the home and to relieve the demand on hospitals.

Health officers should inform themselves of supplies and facilities available under civil defense in many communities which may be used in an epidemic if need be.

Home Care of Patients

Since the uncomplicated case of influenza runs less risk of cross-infections if cared for at home rather than in the hospital, maximum re-

Vaccination of Children

In children a high incidence of febrile but not dangerous reactions to the initial injection of vaccine may be expected. Most of the systemic reactions are related directly to the amount of vaccine given and occur within 24 hours of administration. Reactions are less frequent and milder following the second injection. Persons hypersensitive to egg should not receive the vaccine.

—*Excerpt from a statement by EDWARD C. CURNEN, JR., M.D., chairman, Committee on the Control of Infectious Diseases, American Academy of Pediatrics*

liance should be placed upon home care of those ill, and hospitalization limited, as far as possible, to those cases of influenza with complications or to those with other diseases which might be aggravated by influenza.

Epidemiological Information

The Public Health Service should supply epidemiological information on the national situation and also on a State by State basis. States should be informed of the vaccine available and released, both as to totals and by allocations to the States. Press releases issued by the Public Health Service concerning this topic should be sent directly to the States at the same time they are sent to regional offices.

Vaccination Program

A system of interstate allocation of vaccine based on a voluntary agreement with the manufacturers is recommended.

The Surgeon General should recommend that physicians give priority to:

a) Those individuals whose services are necessary to maintain the health of the community.

b) Those individuals necessary to maintain other basic community services.

c) Persons with tuberculosis and others who in the opinion of the physician constitute a special medical risk.

The Committee on Influenza of the American Medical Association should be asked to as-

sist in implementation of these recommendations.

Advisory Committees

Each level of government is encouraged to establish advisory committees, broadly representative in nature, to consider which groups are deemed essential to maintain necessary services.

Vaccination of Children

Doses recommended are as follows: for pre-school children, 3 months to 5 years, 0.1 cc. intracutaneously or subcutaneously, repeated after an interval of 1 to 2 weeks; for children 5 to 12 years of age, 0.5 cc. subcutaneously, repeated after an interval of 1 to 2 weeks; for children 13 years of age and older, the dose for adults may be used.

Poliomyelitis and Influenza Vaccinations

The committee recommended that the poliomyelitis vaccination program and the influenza vaccination program be continued as independent and parallel programs.

National Commission on Influenza

The Surgeon General should appoint a national commission on influenza to identify research and other needs in relation to the effect of influenza on the civilian population of the Nation, and encourage, support, and coordinate, through existing channels, the planning and the execution of research and other activities designed to meet these needs.

This commission should consider not only the urgent problems in connection with the current epidemic, but also the long-range problems associated with the behavior of Asian and other strains of influenza during the next decade.

The commission should first study serious complications of influenza, particularly deaths, and the methods of their prevention.

The following participated in the plenary meetings:

Maj. Gen. S. B. Hays, Surgeon General of the Army; Dr. F. M. Davenport, director, Committee on Influenza, Armed Forces Epidemiological Board; Dr. M. R. Hilleman, chief, Department of Respiratory Diseases, Walter Reed Army Medical Center; and Dr. C. C. Dauer, medical adviser, National Office of Vital Statistics, Public Health Service.

Dr. K. E. Jensen, assistant chief, Virus and Rickettsia Section, Communicable Disease Center, Public Health Service; Dr. Roderick Murray, director, Division of Biologics Standards, Public Health Service; Dr. J. M. Andrews, director, National Institute of Allergy and Infectious Diseases, Public Health Service; and Frank Barton, secretary to the council on national defense, American Medical Association.

Dr. H. C. Lueth, chairman, Committee on Civil Defense, American Medical Association; Dr. D. A. Clark, chairman, Committee on Influenza, American Hospital Association; Dr. E. C. Curnen, chairman, Committee on Control of Infectious Diseases, American Academy of Pediatrics; and Col. D. M. Alderston, military assistant for professional services, Office of the Assistant Secretary of Defense (Health and Medical).

Col. Arthur Long, chief, Preventive Medicine Division, Office of the Surgeon General of the Army; Col. George Fair, chief, Preventive Medicine Division, Office of the Surgeon General of the Air Force; Capt. J. R. Seal, chief, Communicable Disease Branch, Bureau of Medicine and Surgery of the Navy; and Dr. W. H. Stewart, Assistant to the Surgeon General, Public Health Service, Dr. D. L. Finucane, director, Department of Public Health, District of Columbia.

The following were chairmen of the conference committees:

Dr. D. G. Gill, State health officer, Alabama State Department of Health; Dr. R. N. Barr, secretary and executive officer, Minnesota State Department of Health; Dr. F. D. Yoder, director of public health, Wyoming State Department of Public Health; and Dr. T. F. Sellers, director, Georgia Department of Public Health.

A limited edition of the proceedings has been published by the Public Health Service and distributed widely. The remaining copies may be obtained free of charge from Public Inquiries Branch, Office of the Surgeon General, Public Health Service, while the supply lasts.

Prevalence of Four Enteropathogenic *E. Coli* Groups In Preschool Children

W. T. COOLEY, M.S., and
D. J. SCHLISSMANN, M.S.

THE WORK of Bray (1) in 1945, and Bray and Bevan (2) in 1948, focused attention on a number of *Escherichia coli* serotypes as causative agents of diarrhea. Since that time, a number of reports in Great Britain (3-9) and the United States (10-16) have documented specific evidence of the association of certain *E. coli* groups with clinical cases of diarrhea.

While many of these studies included sampling of populations exhibiting no diarrheal symptoms, the cultures were largely obtained from contacts, children reporting to clinics for reasons other than diarrhea, or from children in institutional environments such as orphanages and hospitals. Limited epidemiological information is available, however, on the age-specific prevalence of the enteropathogenic *E. coli* in normal populations, secondary attack rates, duration of carrier state, and case-to-carrier ratios.

In 1956, a limited study of the prevalence of four enteropathogenic *E. coli* groups in healthy preschool age children was conducted in eastern Kentucky by the Cumberland Field Station of the Communicable Disease Center, Public Health Service. The investigations were part of the diarrheal disease studies of the station.

Procedures

Public health nurses and epidemiological aides have visited households in 6 coal mining camps and 5 rural hamlets in eastern Kentucky at monthly intervals since September 1954 to obtain histories of diarrheal disease within entire families. On each visit they also obtained rectal swab cultures from preschool children to determine the prevalence of *Shigella* and *Salmonella* infections. As an adjunct to the deter-

mination of diarrheal attack rates and *Shigella-Salmonella* prevalence in the study populations, a concurrent study was begun in February 1956 in four of the study populations to determine the prevalence of four enteropathogenic *E. coli* groups in preschool children. *E. coli* 026:B6, 055:B5, 0111:B4, and 0127:B8 were selected for study because they had been most frequently associated with outbreaks of infantile diarrhea by previous investigators. Forty-three preschool children in each of 3 coal mining camps and 1 rural hamlet, making a total of 172 children, were selected for the 6-month comparative study. The four areas were selected as representative of the diversity of housing conditions observed in eastern Kentucky and because considerable variations in both morbidity rates and prevalence of *Shigella* had been previously observed in them. The ages of the children in the four areas ranged from 1 month through 5 years, with approximately equal numbers of children in each yearly age group.

At the time the monthly rectal swab cultures were obtained for detection of *Shigella* and *Salmonella* in the preschool children of the four selected areas, one-fourth of a MacConkey agar plate was streaked with the cotton swab for the *E. coli* studies. The inoculated plates were brought to the laboratory within 4 hours, where the streaking was completed with a wire loop. Attempt was made to obtain well-isolated colonies on most of the agar surface. The cultures were incubated for 24 hours, and each of 20 typical *E. coli* colonies was fished to a drop of 0.5 percent saline solution on a smooth slide and tested against pooled antisera. This polyvalent serum was prepared by mixing equal amounts of *E. coli* 026:B6, 055:B5, 0111:B4, and 0127:B8 antisera with 0.5 percent saline solution to obtain a 1:10 dilution of each specific antiserum. When a colony was found which gave an agglutination, 20 additional colonies were transferred to tubes of triple-

Mr. Cooley is in charge of laboratory services of the Berea College Hospital, Berea, Ky., and Mr. Schliessmann, who was chief of the Cumberland Field Station at the time of this study, is currently chief of the State Aids Section, Technology Branch, Communicable Disease Center, Public Health Service.

sugar-iron agar and heart infusion agar. Final biochemical and serologic identification was carried out according to the recommendations of Edwards and Ewing (17). When a child was found to be carrying 1 of these 4 serotypes, an effort was made to obtain additional cultures from family contacts. A total of 1,000 survey cultures and 28 cultures from family contacts were examined between February 6 and August 20, 1956.

Results

Of the 1,000 cultures examined, 13 (1.3 percent) were positive for 1 of the 4 *E. coli* groups, and 59 (5.9 percent) were positive for *Shigella*. *Salmonella* was recovered from three cultures (see table). Because of the limited number of *E. coli* isolations, no seasonal variation in their occurrence was observed.

E. coli 055, isolated from 6 children, was the most common of the enteropathogenic groups encountered. Group 0111 was identified from 4 children and *E. coli* 0127 from 3 others. Dr. W. H. Ewing examined four of the six 055:B5 cultures and classified them all as serotype 055:B5:H6. All the 0111:B4 strains were 0111:B4:H12. Six of the positive children were 2 years old, 4 were in the 1-2-year category, 2 were 3-4 years old, and 1 was less than a year old. Enteropathogenic *E. coli* were not isolated from any of the 13 positive children on subsequent cultures 1 month following the ini-

tial isolation. Cultures of 6 familial contacts of 1 positive child resulted in isolation of the same *E. coli* group from 2 siblings. Cultures obtained from 22 siblings of 6 other positive children were negative. None of the positive children gave a history of diarrhea during a period of 4 weeks before or 2 weeks after culturing.

Reported diarrheal attack rates, ranging from 11 to 92 per 1,000 person-months experience, were associated with the range of 2.1 to 10.6 percent in *Shigella* isolations. The percentage of enteropathogenic *E. coli* isolations (1.1 to 1.6 percent) was approximately the same in the four areas.

Discussion

The low percentage of cultures yielding any of the four enteropathogenic *E. coli* groups is typical of the results of earlier studies on cultures from nondiarrheal patients in hospitals and clinics. Giles and associates (4) isolated *E. coli* 055 ten times from 324 healthy infants; Stevenson (7) recovered *E. coli* 0111 nine times in 1,024 adults; Taylor and Charter (9) found four *E. coli* 086 groups among 255 well babies; and Graber and Dunlap (12) failed to recover any of 9 enteropathogenic serotypes from 410 pediatric patients in the absence of diarrhea.

Two factors may have contributed to the infrequent isolations of enteropathogenic *E. coli* in the present study. It was necessary to use

Comparison of diarrheal attack rates and isolation rates of *E. coli* and *Shigella* in preschool children in eastern Kentucky, February-August 1956

| Area | Bacteriological examinations | | | | | Reported morbidity (0-5 ages) | | |
|--------------------------------|------------------------------|------------------------------|---------|-----------------------------|---------|-------------------------------|-----------------|------------------------------|
| | Number of cultures | Positive for <i>Shigella</i> | | Positive for <i>E. coli</i> | | Person-months experience | Number of cases | Rate per 1,000 person-months |
| | | Number | Percent | Number | Percent | | | |
| Wheelwright..... | 183 | 4 | 2.2 | 2 | 1.1 | 183 | 2 | 11 |
| Weeksbury ¹ | 281 | 6 | 2.1 | 3 | 1.1 | 281 | 5 | 18 |
| Wayland..... | 243 | 18 | 7.4 | 4 | 1.6 | 243 | 10 | 41 |
| Jacks Creek ² | 293 | 31 | 10.6 | 4 | 1.4 | 293 | 27 | 92 |
| Total..... | 1,000 | 59 | 5.9 | 13 | 1.3 | 1,000 | 44 | 44 |

¹ *Salmonella paratyphi* B and 1 *Salmonella typhimurium* isolated.

² 1 *Salmonella montevideo* isolated.

rectal swabs in the survey in order to handle a larger number of cultures. This method has proved satisfactory for *Shigella* work, but there is still disagreement among workers in the field as to its desirability in *E. coli* studies. Second, because of the large amount of confirmatory work that must be done with the *E. coli* group, it was necessary to use only one MacConkey agar plate for each individual and to limit the number of colonies being screened to 20 per plate. This number of colonies would seem to us to be adequate if 4 or 6 types of *E. coli* are equally distributed on a plate. However, if a particular serotype is present in very small numbers, there is a probability that it will be missed in the procedures employed.

The rate of occurrence of the four *E. coli* serotypes did not correlate with the reported diarrhea morbidity from the study population, in contrast to the correlation of *Shigella* incidence with morbidity (see table). If we may assume that the four enteropathogenic *E. coli* groups were readily recovered by the laboratory tests employed, it is apparent that these particular *E. coli* groups did not contribute appreciably to the diarrheal morbidity in the populations under study. Although the numbers are too small to draw definite conclusions, it is notable that in only 1 of 7 instances was there any evidence of intrafamilial spread. Also of note was the observation that all 13 positive individuals were negative when cultured 1 month later. This low rate of transmission within the family and the apparently short carrier period could possibly be accounted for by the absence of diarrhea. Histories of the positive children indicated that they had no more than one bowel movement in 24 hours. This lessened appreciably the possibility of cross- and auto-infection hazards compared with conditions existing in a household where an ill child has 6 to 12 loose movements during the same period.

Summary

A 6-month survey of the prevalence of *Shigella* and *Salmonella* and four enteropathogenic *E. coli* groups in 172 healthy preschool children was conducted in eastern Kentucky in four areas having diverse housing and sanitary

facilities. Fifty-nine *Shigella*, 3 *Salmonella*, and 13 enteropathogenic *E. coli* were isolated from 1,000 cultures.

Of 13 positive *E. coli* isolations, 6 were group 055, 4 were 0111, and 3 were 0127. *E. coli* 026 was not recovered. None of the 13 positive children gave a history of being ill, and all subsequent monthly cultures were negative. In 28 cultures of siblings of 7 positive children, only one instance of intrafamilial spread was observed.

The four enteropathogenic *E. coli* groups did not contribute appreciably to the diarrheal attack rates in the areas sampled.

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Standard for Enrichment of Milled Rice

A standard for enriching milled rice was published by the Food and Drug Administration on August 27, 1957, specifying vitamins and amounts to be added by rice packers.

The action is the outcome of recommendations by the National Research Council and is based on Food and Drug Administration proposals published December 28, 1956, and on written comments on these proposals.

Under the standard, each pound of milled rice labeled "enriched" must contain 2 to 4 milligrams of thiamine, 1.2 to 2.4 milligrams of riboflavin, 16 to 32 milligrams of niacin, and 13 to 26 milligrams of iron. The cost of these enrichment ingredients would be about 5 cents per 100 pounds of rice. The rice packer who chooses to enrich his product further with vitamin D, or calcium, or both, must add 250 to 1,000 U. S. P. units of vitamin D and 500 to 1,000 milligrams of calcium, to each pound of his product.

At present, no rice on the market fully conforms to the standard. South Carolina's compulsory enrichment regulation matches the new Federal standard in all aspects except that the use of riboflavin is optional.

The standard allows two enrichment processes. In one process, a proportion of the kernels is impregnated with the vitamins. The standard requires packers of this product to apply tests for insuring that the loss in rinsing is kept to a minimum. In another process, all the rice is coated with the enriching ingredients. In this case, the product must be labeled with the caution against rinsing before or draining after cooking.

The standard becomes effective 6 months after publication unless objections are made. Thirty days are given to file objections and to request a public hearing.

New dimensions of learning in a free society

ON the occasion of the inauguration of Dr. Edward H. Litchfield as chancellor of the University of Pittsburgh, May 9-11, 1957, the campus was the setting for a series of distinguished lectures and seminars, including a seminar given with the dedication of the new Graduate School of Public Health.

Among the guests and speakers were:

Charles H. Best, M.D., director, Charles H. Best Institute, University of Toronto; John C. Bugher, M.D., director for medical education and public health, Rockefeller Foundation; G. Brock Chisholm, M.D., former Director General, World Health Organization; Carlyle F. Jacobsen, Ph.D., executive dean for medical education, State University of New York; Paul Mellon, chairman, A. W. Mellon Educational and Charitable Trust; Fillmore H. Sanford, Ph.D., associate director, Joint Commission on Mental Illness and Health, Cambridge, Mass.; Warren Weaver, Ph.D., vice president for the natural sciences and medical sciences, Rockefeller Foundation; Abel Wolman, D.E., professor of sanitary engineering, School of Hygiene and Public Health, Johns Hopkins University.

A few outstanding quotations from the speakers are given below. The full text is to be published by the University of Pittsburgh.

Stakes in Nuclear Power

A great discontinuity in human experience occurred when science first realized, just a few years ago, that fission and fusion of atomic nuclei can be accomplished by man. That discovery suddenly lifted the equation $E=mc^2$ from its previous status as an innocent algebraic oddity to the level of a scientific and social revo-

lution. Whether or not man is going to solve all his problems, in a horrid negative sense, by destroying civilization with nuclear bombs is as yet uncertain. But what is quite certain is that, provided we do go on existing, we will in the future live in a new physical environment . . .

Medical X-rays, fallout from weapons testing, and the undesirable but minor oddments of radiation we receive from other sources are, however, only part of the story. What seems to me of really major importance to the public health problem of the future is the clearly emerged fact that nuclear power installations, on a large and widely dispersed scale, have to be accepted as assured. In October 1956, the switch was closed on the first British power reactor at Calder Hall. It produces somewhat under 100,000 kilowatts. By the end of 1957 seven more power reactors are expected to be operating. But by 1965 the British, in accordance with recently increased plans, expect to have 24 power reactors in use, totaling approximately 6 million kilowatts of output in energy.

The total world requirements of energy for the three main demands of comfort heating, of process heating, and of power are something like 4 billion tons of coal equivalent at the present time. Fifty years from now it seems likely that this requirement will have become at least five times as great; and, as was remarked in a *Fortune* article a few years ago, "Everywhere the need for power bursts through the most careful estimates." We see that nuclear fission can even now compete, under many circumstances, with coal. It is almost impossible to believe that controlled nuclear fusion will not be achieved; and there are even hints, coming

out of the Berkeley laboratories this past winter, that light elements may eventually enter the practical fusion picture. In other words, we might as well face it. We are, and in a truly big way, in for a nuclear power future.

This new nuclear future will pose a large set of new problems for public health. Garbage disposal occupied the attention of Mr. Shattuck a hundred years ago, but the public health engineer of tomorrow must be prepared to cope with radioactive garbage. An array of new regulations will clearly be necessary to control location, shielding, protection against accident, minimizing of risk in the transport of hot material, dispersal and disposal of radioactive waste, and so on. The radiation exposure history of an individual may very possibly turn out to be, in this new future, the most critical item of individual health data. Concentration of radioactive isotopes by sea organisms; storage of long-lived isotopes in the soil, in vegetation, and in dairy products; the slow accumulation of internal emitters, as strontium-90 gets built into our bones; the risk of increased incidence of leukemia; the general influence of radiation exposure in shortening life expectancy; and perhaps of the gravest, because of the most persistent, importance, the genetic damage caused by radiation—these are clearly problems of first magnitude.

At the present moment we can clearly see these problems facing us in ever increasing future impact. And at the present moment we simply do not have the organization, the personnel, or, most important of all, the knowledge with which to meet these problems.

It is all too clear that we must greatly accelerate our activities in that general field designated as radiation biology. It is equally clear that we have to know a great deal more about genetics, both at the most general and fundamental levels and at the more special, the specially difficult and the particularly relevant, level of human genetics.

I dare to suggest—indeed I run the risk of urging—that these may well be the most important public health problems of the next 50 years. The physical sciences have, in one sense, been guilty of creating these problems for you. Public health, medical science, biology, and the physical sciences must team up, in a new and

closer and more effective comradeship, to meet these formidable challenges. The stakes are no trivial prizes of comfort or convenience. The stakes are survival.

—WARREN WEAVER

Sources of Social Infection

Of course we, in the wealthy countries, take it for granted that our local customs are better than those of the so-called underdeveloped countries. Many of our people are astonished to find that in Asia, for example, there are to be found some techniques and methods, particularly in the fields of mental and social health, far superior to ours. We know that maternal deprivation, that is, the loss even temporarily, of physically close, warm mother love, is a potent cause of physical, mental, and social ill health appearing in infancy, childhood, adolescence, or later life. The World Health Organization report, *Maternal Care and Mental Health*, by John Bowlby in 1951 and his summary in the Penguin book, *Child Care and the Growth of Love*, in 1953 document that knowledge. Much of our recent concern for mental and social health has been for early diagnosis of emotional disturbance, particularly in the early school years. It is well known, however, that in most cases the serious and often irreversible damage has been done before school age. Diagnosis of mental illness in childhood is not prevention any more than early diagnosis of cancer or tuberculosis is prevention. Diagnosis may lead to the recognition of causes, but only elimination of the cause or causes is prevention.

Though we know all this we still, even in some of our recently built hospitals, continue to keep newborn babies under glass in nurseries, allowing them to be with their mothers only for the short periods necessary for nursing. We still take babies and small children suffering from illness or injury into hospitals without their mothers, a procedure we know to be destructive to the child's physical, mental, and social development. In some extreme cases we even limit the hours in which mothers are allowed to visit their own children, sometimes to as little as 3 or 4 hours a day. Probably no young child can survive such an experience without some damage to his development.

In contrast, in most Asian, African, and the less highly "developed" European countries, babies are born at home and cared for entirely by their mothers, or in hospitals where the baby remains in bed with the mother or in a cradle close beside her or slung between the upward extended footposts of the bed, always within reach of the mother. Actually this system is far more efficient than ours, requiring far fewer trained nurses and less space, and insuring faster development and recovery from illness or injury. Relative freedom from damage to the necessary close mother-baby relationship is the most important advantage of that ancient system. When the mother with her first baby goes home from the hospital in those countries, she has none of the anxieties, tensions, or awkwardness so many of our new mothers show when they have only been taught to bathe the baby just before leaving the hospital. One of our barriers to better practices in this mother-baby relationship is the unwillingness some nurses show in giving up the babies to the mothers, but it is not sound practice to sacrifice the baby to the emotional desires of the nurses.

Unfortunately, we have succeeded in convincing many of the medical and nursing professions and the hospital architects of many countries that our ways are best, most modern, and most efficient. Most of the Communist countries, for example, have followed us in our hospital architecture and mistaken treatment of babies and children, still build nurseries in maternity hospitals, and in many cases do not provide accommodations for mothers in children's hospitals. It is encouraging to see that a few, but still only a few, of our maternity and children's hospitals in North America are beginning to allow mothers to have their newborn babies with them, and more rarely, even to stay in the hospital with their ill children.

On the basis of reliable evidence, it is in this area that we should be working most earnestly to try to reduce our heavy load of juvenile delinquency and other symptoms of mental and emotional ill health. As Bowlby puts it: "Deprived children, whether in their homes or out of them, are the source of social infection as real and as serious as are carriers of diphtheria or typhoid." In this enormously important aspect of public health we in North America are

among the world's most backward people. We are still largely under the influence of obsolete attitudes and are finding it very difficult to change, though the damage we do our children has been obvious for some time.

This type of damage is of course, from the point of view of world peace and security, and even racial survival, far more dangerous than smallpox, diphtheria, typhoid, yellow fever, or malaria. We cannot expect children deprived of close mother love to be able to develop, to be able to "live harmoniously in a changing total environment," unless indeed they are unusually fortunate in other aspects of the early emotional situation, but we should remind ourselves that that ability has been included in the prescription of minimum requirements for peace and security, written by the nations of the world in setting up the United Nations and its specialized agencies.

—BROCK CHISHOLM

A Tribute to the Social Sciences

Since the war several universities have new medical centers. The manner of their beginning is interesting, for in each instance there has been studied concern for the relation of the health sciences to the general disciplines of the parent university and to the community which these schools will serve. At the University of California in Los Angeles, at the University of Florida, Gainesville, and at the University of Kentucky, Lexington, the planning of the new schools was a university undertaking and not solely the responsibility of a quickly gathered group of department chairmen in the medical disciplines. The faculties of the arts and sciences and of the other professional schools shared in defining the goals and the relationship of the health center to the university and the community. Hence, it is not too startling to find that at the University of Florida the professor of medicine is an active participant in the teaching of undergraduate students in the department of philosophy; nor is it surprising that the building plans for this new health center include a wing for the social and behavioral sciences.

A few years ago, Kentucky determined to establish a medical center for education in the

several health professions. The initial appointees of staff to plan and guide this development are striking. The dean is a former county health officer with 10 years of successful medical school administration. The first appointments to the faculty were not chairmen of either basic science or clinical departments; however, they possessed these qualifications: an internist experienced in comprehensive family care programs; a Ph.D. in sociology who, incidentally, had earned a master's degree in public health; and a Ph.D. in economics whose special competence is the financing and cost analysis of medical care. Dean Willard's initial appointments are not a devaluing of the traditional disciplines in medicine. Rather, they are a tribute to the social sciences for their contribution to understanding the meaning of a medical center and health education within a university and as integral parts of the community.

—CARLYLE F. JACOBSEN

The Meaning of Industrial Health

In the practical definition of program for the University of Pittsburgh Graduate School of Public Health, the letter of gift stipulated, among other things, that the school is "to em-

phasize occupational and industrial health and hygiene; health generally connected with or related to Pittsburgh and similar urban industrial areas; and research with reference to problems arising in connection with the foregoing."

As a layman I am assured that "clinical materials" are essential to make any school of the health professions flourish. If so, Pittsburgh should be the world capital for the study of occupational health. Here are the vast human resources of its industry. Here are the Mellon Institute of Industrial Research, the Industrial Hygiene Foundation, the corporate research laboratories, the Carnegie Institute of Technology and its School of Industrial Administration.

The school is training physicians for the field of industrial health. But industrial health no longer means merely the surgical treatment of accidents on the job. It means prevention, the maintenance of health, the extension of the concepts of public health in the broadest sense. All industry, all labor, their interest in steady production, steady jobs, and steady pay, have a direct interest in this scientific institution which is concerned with basic research and postgraduate teaching.

—PAUL MELLON

New Tribal Relations Officer



Forrest J. Gerard has been appointed Tribal Relations Officer of the Public Health Service's Division of Indian Health, succeeding Peru Farver, who retired from Federal service in February 1957. Since June 1955, he has served as the executive secretary of the Wyoming Tuberculosis and Health Association in Cheyenne.

Mr. Gerard, a member of the Blackfoot tribe, will be responsible for relations between some 250 Indian tribes and the Federal Government's Indian health program, which was transferred in 1955 to the Department of Health, Education, and Welfare from the Department of the Interior.

After receiving a bachelor of arts degree in business administration from the Montana State University in 1949, he worked for 5½ years in Helena, Mont., first on the staff of the Montana State Department of Public Instruction and later with the Montana Tuberculosis Association.

Public Health Disaster Aid

in the

Rio Grande Flood of 1954

F. J. VON ZUBEN, Jr., B.S., G. R. HAYES, Jr., M.S., and E. C. ANDERSON, M.S.

AS HURRICANE ALICE, the first hurricane of 1954, whirled out of the Gulf of Mexico and across a sparsely inhabited section of Mexico below Brownsville, Tex., inflicting only minor damage to the Brownsville-Matamoros area, the residents of Texas and northern Mexico relaxed and began enjoying the long-needed rains that came to the lower Rio Grande Valley. But Hurricane Alice was not to be dismissed so lightly. As the main body of the storm moved northwestward across Mexico and into the Pecos Valley of Texas, it pushed huge masses of moist air some 650 miles inland from the mouth of the Rio Grande. Great torrents of water were released on the watershed of the Rio Grande in both Texas and Mexico as this storm blew itself out in the Pecos Valley.

On Sunday, June 27, torrential rains fell on

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John R. Bagby, Jr., of the Technology Branch, Communicable Disease Center, assisted in compiling the information contained in this report.

Crockett County, and a 36-foot wall of water rushed down Johnson Draw to Devils River and on to the Rio Grande to join waters from northern Mexico and the Pecos Valley. As much as 34 inches of rainfall was observed during the storm period at points 22 to 40 miles northward from Langtry, Tex. The Pecos River crested at the Southern Pacific Railroad high bridge 16 miles east of Langtry at 96.24 feet, and one of the greatest natural disasters in the history of the southwest was on the move.

Extent of Flood Damage

At 5 a.m. on June 28 the floodwaters in Johnson Draw crested in Ozona, isolating the town and driving approximately one-third of the population from their homes. Many homes were destroyed by the rushing water, and the number of deaths was eventually established at 22. Many head of livestock were lost, and many of the carcasses were left in or near the town by the receding floodwaters. Three fires in the city burned out of control because fire hydrants were submerged by floodwaters.

At Del Rio the Rio Grande began to rise on June 27 and reached its crest of 38.25 feet at 9:30 a.m. the next day. Comparatively little damage was suffered on the American side of the river, since Del Rio is some distance away. Very little rain fell in this area, so the San Felipe Creek, from which the city obtains its water supply, did not rise, and the water plant remained in continuous operation. Only a few

families residing in bottom lands adjacent to the river had to be evacuated.

Acuña, in Mexico, across the Rio Grande from Del Rio, was devastated. Most of the residents heeded advance warnings and fled to the hills nearby, but they suffered severe property losses. The approach to the international bridge was inundated and washed out. The Quemado Valley, above Eagle Pass, was flooded, and the irrigation system was so severely damaged that water from the river could no longer be diverted into the canal system. Many residents of the valley use the canal water for domestic purposes.

The flood crest moved on down the river, reaching 53.51 feet at Eagle Pass at 4 a.m. on Tuesday, June 29. At this point it exceeded the previous high of 49 feet, which had occurred on September 2, 1932.

Operation of the water treatment plant at Eagle Pass was discontinued at 3:30 a.m. Two emergency gasoline-driven sump pumps had been installed previously to protect the main electrical control panel, the wash water pumps, and the motors of the vertical high-lift pumps, which were all located in the basement. The shower, toilet, and other plumbing fixture drains had been plugged and the doors calked and sandbagged to prevent entrance of water. In spite of these precautions, leaks in the basement wall increased until the safety of personnel was threatened, and the plant was closed.

The entire business section of Eagle Pass was flooded to a depth of 8 to 10 feet, and the city's sewage treatment facilities were completely inundated. Although there was extensive settling of backfill along the sewer lines, no major breaks or serious clogging occurred, and sewage flowed freely to the treatment plant and to the flooded river. Two of the four oxidation ponds were washed out, and the treatment plant suffered some damage but continued to operate. Property losses of merchants were severe, and many homes in low areas along the creeks were flooded.

Floodwaters first seeped through the levee on the Mexican side of the Rio Grande at Piedras Negras into an old riverbed, trapping residents who had not heeded warnings to leave their homes. As the flood approached its crest, it overflowed the levee, and the trapped people

were forced to the roofs. There they huddled by lantern light to wait out the flood. During the night observers on the American side watched helplessly as the adobe homes melted and sank, and the floodwaters extinguished the lights one by one. Because many of these people were itinerant workers seeking entrance into the United States, the casualty list could never be definitely established.

On Wednesday, June 30, at 9:30 a. m. the Rio Grande reached a record crest of 61.35 feet at Laredo, 10 feet above the previous high mark on September 3, 1932. The International Boundary and Water Commission engineers anticipated a crest of 26 feet above the floor of the international bridge; it was 8 inches higher. Reports of the disasters at Acuña and Piedras Negras forced acceptance of the warnings at Laredo and Nuevo Laredo. The low areas along creeks in Laredo and the extensive low areas of Nuevo Laredo were evacuated. Consequently, no lives were lost in either city even though a large section of Nuevo Laredo was completely demolished by the rushing floodwaters.

Early in the evening of June 29 the raw water pumps at the Laredo water treatment plants became flooded and failed. The old plant, which had a capacity of 9 million gallons per day, was flooded and put completely out of commission.

The Laredo sewage treatment plant was completely submerged and had to be bypassed for a considerable time; but since the low areas along the creeks, which were mostly unsewered, comprised the major portion of the flooded area, there was no serious damage to the collection system.

Along the 250 or more miles of ravaged river course, many municipal water facilities were destroyed or inundated, and wells or other sources of supply were filled with filth-laden surface water. Sewage treatment plants and garbage disposal facilities were destroyed or severely damaged. Litter and silt covered the land, and putrescible material deposited with it was malodorous and provided limitless resources for the propagation of flies and other vermin. Mosquitoes multiplied rapidly because of the thousands of acres of residual water, and

they found easy access to the dispossessed human population.

Mobilization of Resources

On June 27, the day the flood crest first threatened residents of the border, the Texas Defense and Disaster Control Center at Austin was activated. This group, which was to become the operations nerve center of the disaster activities, was made up of representatives of the Texas State Departments of Health, Public Safety, Public Welfare, and Highways, Aeronautics Commission, Insurance Commission, Attorney General's office, and Railroad Commission; the State relations officer of the American Red Cross; a regional Public Health Service engineer; and the assistant regional director of the Federal Civil Defense Administration. The center immediately commenced mobilization of all resources for aid to the stricken and endangered areas.

The Communicable Disease Center of the Public Health Service was alerted Monday morning, June 28. Then or subsequently, arrangements were made for the assignment of two vector control specialists, 20 semiskilled laborers, 4 power-spray units, 20 hand-spray cans, 2 portable water treatment plants, 7 trucks, and a supply of insecticides and water treatment chemicals.

As the flood crest started downstream, there was no way of knowing the extent to which it might be supplemented by waters from northern Mexico; therefore, State and Federal personnel were alerted and material was readied for aid to the lower Rio Grande Valley should the Falcon Dam prove inadequate. The International Boundary and Water Commission opened the gates of the dam to maintain the river flow at half bank. When floodwaters began reaching the lake, the river below was allowed to flow bankful. Two and one-half million acre-feet of floodwaters was eventually held behind the dam with no damage to the lower valley.

On July 1 the flood was declared a major disaster under Public Law 575 (81st Cong.). Hence, responsibility for coordinating Federal assistance was assumed by the Federal Civil Defense Administration under authority of Executive Order 10427.

Ultimately, the governmental, voluntary, commercial, and individual forces of two nations equipped to deal with such disasters were gathered in this area to protect the health and welfare of the affected inhabitants.

Emergency Public Health Measures

Throughout the period from June 27 to July 8, the Texas Defense and Disaster Control Center maintained a constant check on the developing disaster and the needs created, using the mobile radio communications of the Texas State Department of Public Safety. Through joint action of the various participants the center located, procured, and dispatched to various points in the area technical personnel and essential supplies and equipment as they were needed.

Ozona

On June 30, when the flood crest was just reaching the Laredos, vector control operations were initiated in Ozona. At the request of the Ozona health officer, relayed to the Austin control center by an amateur radio operator, insecticides, power- and hand-spraying equipment, and vector control specialists from the State and the Public Health Service were sent to the town.

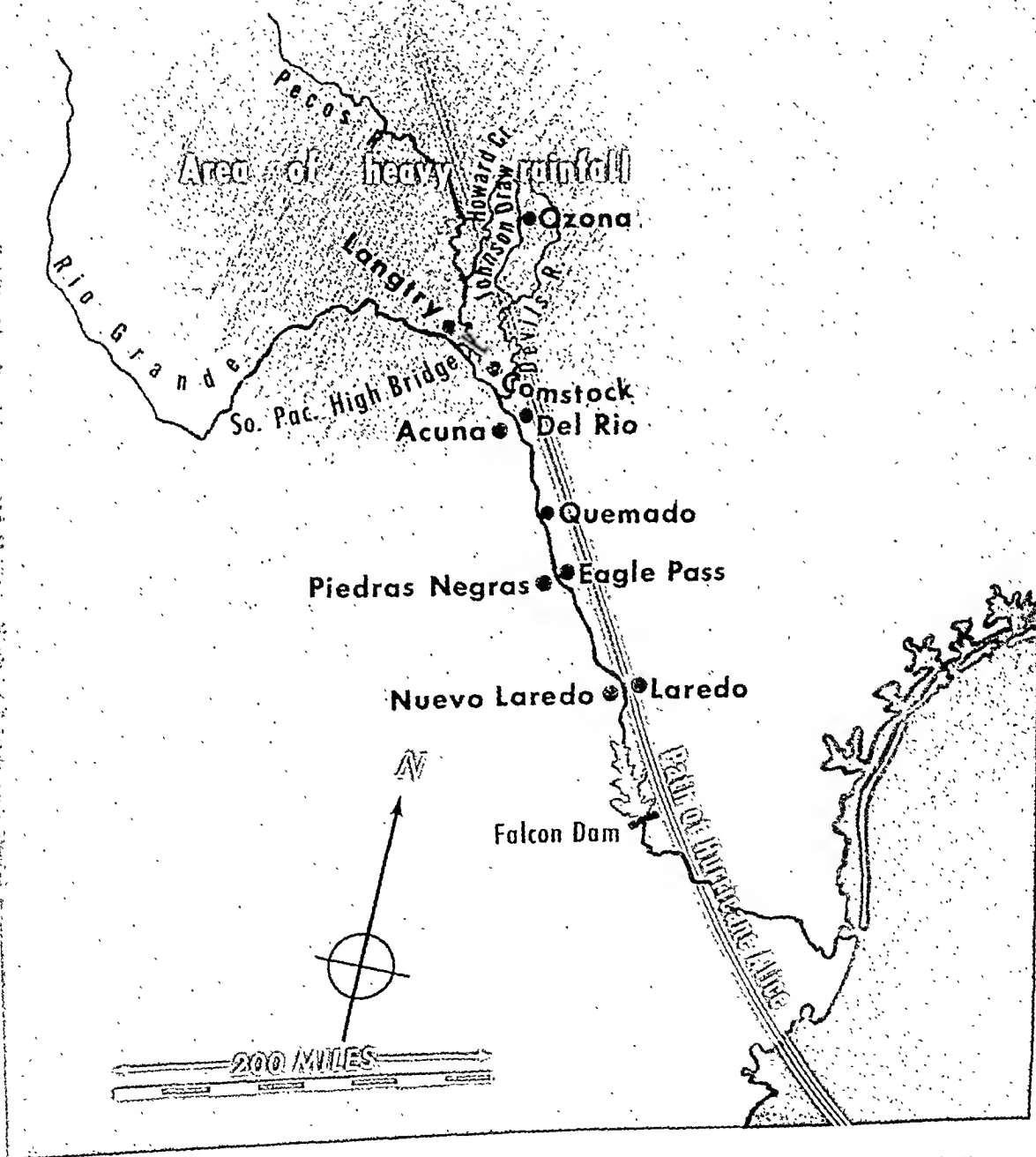
By Thursday, July 1, flies and mosquitoes were under control; an oil-DDT larvicide had been applied to all standing water; privy pits had been thoroughly treated with 3 percent gamma benzene hexachloride (BHC) dust; and the city had been space sprayed twice with a DDT emulsion using truck-mounted equipment. At the direction of CDC and State health personnel, many animal carcasses were removed to rendering plants. Those originally overlooked in the bushy areas of Johnson Draw were buried with bulldozers. Meanwhile, immunization clinics had been established, damaged food removed, and water and milk supplies checked for safety. All operations were turned over to local personnel on July 2, and State and Federal men and equipment were moved on down to the Rio Grande to bolster the crews already working downstream.

Comstock

Early in the flood crisis, normally quiet or dry streams throughout the area became raging

Rio Grande Valley

Area affected by flood of 1954



Eagle Pass



Nuevo Laredo



Laredo



Nuevo
Laredo

torrents, ripping out highway and railroad bridges and communications lines. Word was received at the State center that many motorists and 266 persons aboard a Southern Pacific train were stranded north of Comstock, Tex. The State relations officer of the American Red Cross arranged for the Red Cross to reimburse the military for the cost of evacuating stranded persons by helicopter to Comstock. All local Red Cross chapters in the flood area were alerted, and arrangements were made for medical personnel to be on hand to meet the rescued persons.

Del Rio and Acuña

Destruction of the approaches to the international bridge connecting Del Rio and Acuña cut off ground transportation between the two cities; contact was reestablished by helicopters obtained through arrangements with the military and the Red Cross. Until other help arrived, the people of Del Rio sent generous quantities of food, milk, and water to the stricken Mexican city. The Red Cross then furnished food, shelter, and field kitchens for the preparation of food. Insecticides were provided through public subscription by the citizens of Del Rio for treatment of the entire area.

By midnight of June 29, typhoid vaccine and drugs, water purification tablets, insecticides, insecticide-dispersing equipment and personnel, flushing equipment, and mobile water purification units were on the way to the remaining stricken and endangered areas along the river. By noon of July 1, immunization clinics and vector control operations were in full operation in those areas already passed by the flood crest.

Eagle Pass and Piedras Negras

Floodwaters at Eagle Pass, which had crested at 4 a.m. on June 29, subsided so quickly that it was possible to return to the water treatment plant $2\frac{1}{2}$ hours later. There was no major damage to the plant building, and only the wash-water pump motors had been flooded. The raw water submersible pumps were not damaged. The equipment was checked, the filters and final sedimentation basin were disinfected with high-test calcium hypochlorite, and the plant was back in operation by noon. No major breaks in the water mains occurred, and

within the hour all sections of the city had adequate water pressure with free chlorine residuals in excess of 1 p.p.m. throughout the system.

State and CDC vector control personnel began operations in Eagle Pass on July 1 with three pieces of CDC automotive equipment, a power mist sprayer, hand-spraying equipment, and insecticides. Crews began the treatment of 900 privies in the city with 3 percent gamma BHC dust, and residual spraying of privy buildings and animal pens and larviciding of all residual water were started. Space spraying for the control of increasing mosquito populations was also commenced. Much organic material in the flooded area required immediate and regular treatment until it could be disposed of in a sanitary landfill.

At this time, mosquitoes were becoming a serious hazard in the Quemado Valley. Large areas here and in the Rio Grande riverbed adjacent to Eagle Pass were beyond the reach of either ground power equipment or hand-spray crews. Following authorization by the Maverick County judge, these areas were dusted by airplane with 10,000 pounds of 3 percent gamma BHC. With a CDC power sprayer, space sprays and larvicides were applied to mosquito-breeding areas in populated portions of the valley.

Also on July 1, helicopter service between Eagle Pass and Piedras Negras was established to carry food and medical supplies to the Mexican city. All available fire hoses from Eagle Pass and many adjacent communities and from Saltillo, 80 miles south of the Rio Grande, were gathered, joined together, laid across the remains of the international bridge and tapped into the Eagle Pass water system. Safe water was thus supplied to Piedras Negras until its water plant could be restored to operation.

Insects in Piedras Negras found favorable conditions for breeding. In one flour mill, for example, huge stacks of milled flour and 500 tons of wheat were soaked under 10 feet of water. The enormous increase in the fly population made control by insecticides impossible. Removal and burial of such material, a task of major proportions, thus became imperative. Even after this material was removed, many potential breeding places for mosquitoes and flies remained. In the first few days after the

flood, Piedras Negras and the adjacent area were dusted by airplane with 10,000 pounds of BHC. Materials and air service were contributed by the people of Eagle Pass and Maverick County.

On June 29 a request was made to the State control center for an improvised hospital for Piedras Negras. Through joint action within the center by representatives of the various agencies, all essential items were located, procured, and cleared for air transport within 3½ hours.

Laredo and Nuevo Laredo

As the flood progressed, it became apparent that Laredo would be the most severely affected of the communities in the United States. The Texas State Department of Health requested that an engineer from the Public Health Service regional office be sent to Laredo to assist in emergency sanitation and rehabilitation activities. As more complete information on the flood reached the Texas control center, the extent of vector problems at Laredo became predictable.

By the afternoon of July 2 the situation in the flood areas had become fairly stable; that is, existing problems were rather well known, and the amount of assistance that would be required throughout the river's course could be estimated. At this time, a board was established at Laredo for hearings under Public Law 875 to make available Federal financial aid for emergency repairs to public facilities damaged by the flood.

Reestablishment of an adequate supply of safe water was a pressing need in Laredo. High water prevented reactivation of the two treatment plants until July 1. In the meantime, since it was known that the raw water intakes were damaged, an emergency gasoline-engine-driven, skid-mounted pump with a capacity of 5 million gallons per day was obtained.

The old treatment plant in Laredo was severely damaged. Water had reached the second floor, and great quantities of silt, debris, and logs had entered the various buildings. Electrical wiring was ruined, chemical-feed machines were badly damaged, and the high-lift pump and motors and the electrical control panel were flooded. The area around the raw

water source had been washed away, and the 30-inch pipe header was broken.

The Laredo Waterworks System immediately contracted with a construction company to restore temporary service. Approximately 1 million gallons of water in the settling basins at the old plant were pumped to the main with the emergency pump. Drinking water was rationed to the public from a 1½-million-gallon supply of treated water which, through foresight on the part of the plant operators, had been stored in elevated tanks before the plant was inundated. Access roads to the plants and to the river had been washed out, but a supply of water was available from a lake at the edge of the city. Ten 1,000-gallon water tank trucks, supplied along with gravel trucks and bulldozers by the State highway department, transported water, after it was treated, to distribution points throughout the city. A sufficient supply of safe water was thus assured.

The road to the water treatment plants was repaired, and thousands of yards of gravel and dirt were used to build a road to the river. It finally became evident that the heavy deposit of silt would not provide a secure footing for the pump and that a floating mount would have to be obtained. For use as a temporary mount, a section of pontoons was provided by the United States Army Engineers, who were constructing a pontoon bridge for a temporary crossing in place of the washed-out international bridge. A temporary steel line was installed and connected to the undamaged section of the 30-inch line, and raw water was again available to the new treatment plant on July 4.

Throughout the emergency all water delivered to the distribution system had a chlorine residual of at least 10 p.p.m., and adequate residual was found to be available over the entire distribution system. By July 12 the motors of the low-lift stations and the pipe connections to the 30-inch line had been repaired, and an adequate raw water supply was available to the new plant. The rate of filtration was increased and about 7 million gallons per day was supplied to the city, which has a normal daily demand of 12 to 14 million gallons. Repairs to the old plant proceeded slowly as originally unforeseen difficulties were encountered.

A vector control specialist of the Communicable Disease Center was designated as the principal Public Health Service representative in the flood area for advising on insect control. The Laredo phase of insect control activities was begun on July 1, with the arrival of a power sprayer-duster and an emergency supply of chemicals from the Tyler, Tex., warehouse.

By July 3, hand-spray crews, using transportation provided by the city, were larviciding residual water and treating all organic material in the flooded areas. Dead fowl and animals were treated thoroughly, and the city garbage department was notified of their location. All carcasses were removed within a few hours after they were found.

Because of the initial interruption of service and the increased load, the city garbage department was unable to maintain a regular collection schedule, and flies multiplied rapidly. A jeep-mounted sprayer belonging to the Public Health Service was brought in from Eagle Pass on July 4 to supplement the State's mist sprayer. A round-the-clock schedule was set up for treating the city and a large mosquito-breeding area to the north with 5 percent DDT emulsion and 10 percent DDT dust. The mosquitoes were quickly conquered, and the fly population was reduced to a point well below normal in all sections of the city. The flooded areas of the city and the debris-laden riverbed were dusted with 3 percent BHC by an airplane provided by the United States Corps of Engineers. As insecticides became available, crews began dusting all of the city's 4,500 privy pits with 3 percent BHC and residual spraying all flooded buildings.

Since a large section of Nuevo Laredo had been completely demolished by the flood, the need for housing, food, and clothing was urgent. The Mexican Government immediately began construction of temporary housing for the displaced families, and food and clothing were provided by the American Red Cross. The insect problem, always a major one in this city, was intensified. Power-spraying equipment was offered the city, but a lack of trained personnel made its use impracticable. Hand equipment, insecticides, and technical supervision were supplied and put to use.

Postemergency Measures

As the board established on July 2 in Laredo to hear requests for Federal aid began to function, requests to the State control center in Austin dwindled, and on July 8 the center was closed. The Laredo board directed the planning of programs that were to continue long after the flood had passed. It approved Federal Civil Defense Administration projects in Crockett, Val Verde, Maverick, and Webb Counties, and in Eagle Pass and Laredo, costing approximately \$663,031, for emergency cleanup, insect and vector control, repairs to water and sewage facilities, repairs to streets, roads, and bridges, and emergency medical and other supplies.

Most operations after July 8 were extensions of the emergency activities and construction work in the repair or replacement of public and private facilities. On July 10 a temporary bridge was opened between Eagle Pass and Piedras Negras. On July 12 raw water was restored to the new treatment plant in Laredo. Until August 25, however, the two water purification units provided by CDC continued to furnish emergency drinking water supplies in the Quemado Valley.

On July 19, CDC hired 7 inspector-foremen and 9 laborers to extend the vector control work at Laredo, and a long-term sanitary improvement project was begun in that city.

Throughout the critical period, immunization clinics operated quietly and efficiently. Sixty-eight thousand of the 100,000 residents of the disaster area of Mexico and 62,000 of the 80,000 Texans were immunized against typhoid fever. Vaccine for both Americans and Mexicans was furnished by the Texas State Department of Health and the Fourth Army Headquarters.

No outbreaks of dysentery or diarrhea were observed. In fact, the incidence of these diseases appeared to be below normal, probably as a result of better diets, sanitary food storage and preparation by the Red Cross, safe drinking water, and the control of insects. Not one case of communicable disease which could be charged directly to the flood was reported on either side of the border.

During this disaster, many individuals and

organizations contributed equipment, money, and services to add to the total relief activity. Usually such action is unrecorded. However, one instance of such assistance can be reported here. During the July 4 weekend, the need for insecticides in the Laredo area had become critical. Material had been delivered as far as San Antonio, but it was delayed there awaiting Government transportation to the disaster area. A San Antonio, Tex., truckline operator donated the services of a truck and driver to rush 8,500 pounds of the badly needed chemicals to Laredo.

By September 3 nearly all emergency work was finished and another disaster had become history.

Lessons From the Experience

A natural disaster such as the Rio Grande flood of 1954 demands immediate and force-

ful action to save lives, protect property, and minimize suffering. From a critical review of the problems encountered and the action taken, one lesson stands out clearly: The prompt activation of a disaster control center in which representatives of all local, State, and Federal agencies concerned serve cooperatively under a central authority to observe the developments and trends of the catastrophe, evaluate the problems, plan the emergency action, and initiate relief measures is of inestimable value. An operational headquarters at the site of the disaster as an extension of the disaster control center would insure maximum efficiency by minimizing duplications of actions and misunderstandings.

Development of the framework for a disaster control center in each State and Territory would be an excellent step forward. Collectively, such centers would constitute a valuable national resource in disaster aid.

technique

Community Nursing Service

An experiment in community nursing conducted for more than 2 years in school district 4, Sparta-burg County, S C, combines school nursing with nursing care of the sick and other aspects of public health nursing.

The program was initiated in response to a recommendation made in 1951 by Dr Carl Buck that the nursing services of the county health department and the Visiting Nurse Association be integrated. Carried out by two nurses, Miss Marjorie Cannon and Miss DeVieux Campbell, under the supervision of the county supervisor of nurses, Miss Evelyn Johnson, the combined service was directed by Dr J C Hedden, the county health officer.

According to Sam C Bissie, district 4 school superintendent, setting

up the program in trial demonstration form has allowed improvisation and close adaptation to the needs of the community, a textile region with both urban and rural components in a population of about 12,500.

Scheduled visits to the 8 elementary and 3 high schools provide teachers with the opportunity to consult the nurses on problems arising with the students or in homes represented in their classes. Repeated visits by the same nurses to the same families, whether to see the school child or another family member, enable the schools to maintain continual contact with homes where health problems interfere with the children's education. Through personal contact, the nurses have been able to recognize other home problems and refer them to the proper agencies. As representatives of the school or of the nursing service, they work with such welfare organiza-

tions as the Woodruff Exchange Club, from which they obtained eyeglasses for needy children. They have also worked closely with the tuberculosis association in planning and carrying out an X-ray survey.

In the school instruction program, the nurses show films and teach home and disaster nursing to home economics classes. All schools have been provided with standardized first aid supplies and charts showing how and when each item is to be used.

Bissie feels that the combined nursing service represents a greater contribution to this community than the work of many school nurses who remain all day in one building waiting for an accident to happen. Of all the types of nursing programs possible for the district, it comes the closest to fulfilling the total needs of the community for nursing services, he stated.

We have the same climate; we have the same soil; we have the same people; and we have the same diseases. The international boundary does not stop the crossing of germs, and the only answer to our public health problems is the one we work out together.—Governor Maldonado of Baja California.



CONFERENCE REPORT

The cooperative flow of ideas and information across the border continues through the medium of the United States-Mexico Border Public Health Association. This year, at its 15th annual meeting in San Antonio, Tex., April 9 to 12, public health officials examined joint health projects and problems as yet unchallenged. Pervading the discussions was the theme of perfecting and expanding health techniques.

Meeting the Challenge Through Border Programs

In his address as president of the United States-Mexico Border Public Health Association, Dr. Guillermo M. Soberanes urged renewed efforts in border health programs, particularly those of environmental sanitation. A personal visit in 1956 through the region convinced him that progress does not hinge solely on Federal or State aid; participation must be enlisted in the local communities directly affected.

Soberanes, who is chief, Coordinated Services of Health and Welfare, Hermosillo, Sonora, Mexico,

commended the States of California and Baja California for their smooth collaboration, which, he felt, ought to be extended along the border. He advocated daily meetings and frequent interchange of discussion instead of at annual conferences only. Local health authorities must know more about the objectives of the association and must be stimulated to take part in all activities and given facilities to attend the annual meetings, he said.

During the past year the association concentrated on translating earlier recommendations and agreements into action. For example, the direct exchange of information on venereal disease contacts between

local health departments on both sides of the border was put into effect through the use of specially designed forms, a significant step in venereal disease control, he said. Also, health departments set up an effective system for transmitting weekly communicable disease reports across the border. The bi-state and tri-state meetings to discuss public health problems be described as the most practical medium for the exchange of information.

For mosquito control on the Mexico-Texas border, international, Federal, State, and local health agencies collaborated in entomological surveys. In June 1956 a survey of mosquito vectors was carried out

throughout the lower Rio Grande Valley from Brownsville-Matamoros to El Paso-Ciudad Juarez.

Realization of the border survey of health problems and resources was brought nearer by the Mexican Ministry of Health and Welfare, which expressed its interest in such a survey to the Pan American Sanitary Bureau. This step, supported by a similar move by the United States, permits immediate planning.

In conclusion, Soberanes pointed out that if the association is to continue toward its objectives, it must achieve a sound financial and administrative structure.

Sanitation Standards For Tourist Facilities

The fact that travelers are especially vulnerable to health hazards from deficient sanitation has stimulated action by a number of organizations, culminating in the preparation of minimum sanitation standards for tourist facilities.

Briefly sketching the background for these steps, George O. Pierce, chief, environmental sanitation branch, Pan American Sanitary Bureau (regional office for the Americas of the World Health Organization), outlined current, independent efforts of travel agencies and hotel associations to protect their patrons. He remarked that criteria used by these groups in inspecting and grading tourist accommodations are often, although not always, based on the knowledge and experience of public health workers. Heightened interest of countries in the Western Hemisphere in improved sanitation for travel centers reflects the possible damage to tourist revenues when potential visitors are exposed to the risk of disease.

Momentum for action taken by the Pan American Sanitary Bureau came from the Inter-American Travel Congress. In accordance with an official request from the congress in 1946, the Bureau appointed an eight-member committee to prepare a set of minimum sanitation standards applicable to tourist accommodations. In drawing up the manual, the committee will consult public

health authorities in countries with special interest in tourist traffic.

Another manual is under preparation by the Joint International Civil Aviation Organization-World Health Organization Expert Committee on the Hygiene and Sanitation of Airports. This committee Pierce described as an outgrowth of the sixth meeting of a special committee on international sanitary regulations, set up by the Third World Health Assembly in 1950, during which attention was drawn to the embarrassment and delays to commercial aviation from insanitary conditions. Activities of both the ICAO-WHO and the PASB committees will be coordinated.

He pointed out that, although the basic principles of sanitation are universally applicable, the degree of protection needed and suitable or available means of providing it vary from place to place. With this in mind, the committees are developing guides of practical value to public health officials and organizations interested in tourism.

Training Voluntary Aides In Rural Mexico

The program to train auxiliary rural health workers in Comarca Lagunera, Coahuila, was outlined by Gudelia Hernandez, Cooperative Rural Medical Service, Ministry of Health and Welfare, Mexico. She described this educational effort as a vital preliminary to the participation of rural areas in the government's overall health program.

Training is conducted by the Cooperative Rural Medical Service whose responsibilities are medical treatment assistance, medical sanitary methods, maternal and child welfare assistance, environmental sanitation, and social organization of the community. To achieve its objectives, the service offers permanent inservice training and technical aid and supervision.

Community leaders and officials recruit voluntary aides, chosen on the basis of personality and character. Recruits are between 15 and 20 years of age. The teaching staff, including a physician, a public

health instructor, two economists, and a physical training instructor, give courses in first aid, home cleanliness and distribution of living space, cooking, nutrition, organization and hygiene of the kitchen, sewing, basketmaking, and repair of discarded utensils.

Trainees study from 9 a. m. to 2 p. m. 3 days a week for 6 months and take examinations every 2 months. The course concludes with an exhibit and the award of a ring and diploma to each graduate.

Mexico Systematizes Public Health Training

Mexico's expanding health programs are bolstered by the systematic, step-by-step training of public health workers described by Dr. Felipe Garcia Sánchez, director, division of coordinated state health services, Ministry of Health and Welfare, Mexico.

New workers, after observing public health programs in action at demonstration centers, spend 75 days at training centers to learn theory and practice. After inservice training at health centers, they proceed to regular courses at the School of Public Health. Engineers are sent to the Postgraduate School of Sanitary Engineering of the National University of Mexico. Fellowships for observation in public health in other countries are available to appointees with master of public health degrees.

Forty-five health centers scheduled for construction will be used as training centers, he said, providing additional facilities for the program. Trainees now number 1,642.

Inservice Training Course For Public Health Nurses

To meet the shortage of public health nurses in the border States, an inservice training program has been set in motion by the Mexican Ministry of Health and Welfare. According to Esperanza Sosa Vazquez, public health nurse with the division of nursing and social work in the Ministry, nursing schools in

the region do not offer public health courses to the relatively few students enrolled.

The inservice education program is planned and applied by the chief nurse of the local health center. Key administrative and technical personnel in each center help to model the nursing service.

The course emphasizes the educational role of the public health nurse in relation to the services offered by the center. Often these services include maternal and child hygiene, control of communicable diseases, physiotherapy, mental hygiene, and dental hygiene. Further training prepares the nurse for work in mothers' clubs. Each club, Sosa Vazquez explained, meets with a nurse and social worker.

Safety and Sanitation Before Horticulture

Dry weather during the last 7 years in Texas has turned many rural and small-town families to essential homestead improvements, which in years of normal rainfall would have been neglected in favor of planting shrubs and rosebushes.

In a description of the 1956 drive for sanitation and safety at home, Sadie Hatfield, extension specialist in homestead improvement, Texas Agricultural and Mechanical College, reported that through demonstrations by trained agents the safety of 4,213 homes had been enhanced. Trash burners were added, water wells tested and made safe, drainage areas eliminated, and septic tanks installed. Setting up recreation equipment, walks, and drives were other dry-weather improvements.

Hatfield trained a core of 296 home demonstration and some county agricultural agents to help make rural homes more comfortable, convenient, and beautiful. For mass results in vast Texas, the staff was augmented by trained local club leaders and "result demonstrators," families who had already improved home grounds according to recognized standards.

Agents, demonstrators, and lead-

ers were trained in large workshops in cooperation with other specialists, college faculty members, and employees of the Texas State Department of Health, and other government agencies, and business firms. The result, she said, was that 1,440 leaders gave method demonstrations to 23,267 people. They taught families how to root shrubs and trees from cuttings and seed, transplant trees and shrubs, take water samples for testing drinking water, build safe trash burners and good clotheslines, make flowerbeds, and conserve soil and water.

In another phase of extension work, the 4-H shrub identification contest for youngsters 9 to 20 years old was conducted at county and district levels and finally at the State level. Points were given for answers on shrubs and trees and their correct uses on home grounds, for pictures of homesteads with safety and sanitation improvements, and for written compositions on protecting water supplies and on waterborne diseases.

The Texas Forest Service supplied low-cost windbreak trees for western areas. In 1956, mostly in irrigated lands, 689 were planted. Hatfield explained that windbreaks lessen dust as well as wind. She reported that 750 families made homestead improvements.

Border Diarrhea Decline Less Than National Rate

Lives lost to diarrheal disease in the four Mexican States bordering the United States formed a slightly larger proportion of the total for Mexico in 1954 than in 1945. Dr. Carlos Ortiz Mariotte, Department of Epidemiology and Special Health Programs, Mexican Ministry of Health and Welfare, compared the 42-percent nationwide reduction during the 10-year period with 48 percent for the border States, and, in the infant group, a 66 percent drop nationally with 64 percent on the border. In diarrheal disease, he grouped dysentery, gastritis, dnode-nitis, gastroenteritis, colitis, enteritis, and diarrhea of the newborn.

Combined figures for the decade 1945-54 show 102,000 diarrheal-caused deaths for Mexico, of which 26,600, or 26 percent, were in the border States. Sixty percent of the national total were infants compared with 72 percent for the infant component in such deaths on the border.

In 1954, 65 percent of the diarrheal disease deaths in the 4 States were in infants, while 50 percent was the comparable figure for Mexico as a whole.

Pioneering Techniques In Bracero Survey

A mass blood-testing campaign ushered in a syphilis case-finding survey of Mexican farm workers, or *braceros*, entering the United States in the late summer and early fall of 1956. Piloted by the Public Health Service, the survey was a model of effective cooperation between private enterprise and public health workers.

Survey techniques and findings were described by two officials of the Public Health Service, Dr. William J. Brown, chief, Venereal Disease Branch, Communicable Disease Center, Atlanta, Ga., and Dr. Johannes Stuart, program management officer, Washington, D. C.

From August 16 through October 12, 115,506 *braceros* were blood-tested as they passed through reception centers at El Paso, Tex., and El Centro, Calif., at the rate of 400 an hour. Clerical tasks were cut to a minimum by mimeographing identification cards bearing blood sample tube numbers and workers' destinations.

Of the 9,240 positives 6,788, or 74 percent, were found for diagnosis and treated while they were still in the United States. Those entering by way of El Paso were located by health department investigators of the States receiving them, and, for the most part, treated in public clinics. In California an insurance company providing medical care for *braceros* volunteered to locate seropositive men, with help from growers' associations and farmers, and to supply diagnosis and treat-

ment. This free assistance and economies from the size of the operation more than offset high travel and maintenance costs for personnel, transforming the survey into one of the most economical of its kind.

The next stage consisted in notifying the appropriate State health departments in Mexico of positive reactors who were missed. The new Pan American Sanitary Bureau form was used for this purpose, as it was for reporting on wife contacts. Gleaned from U. S. Department of Labor files, names and addresses of the wives were sent to Mexican health departments with the request for notification on the results of investigations.

Of the total contact notices sent, reports on 6.8 percent were returned. Certain Mexican states completed almost all the forms; others none at all. The variation in response points to the need for clarifying use of the forms in some areas in Mexico and for care in transcribing addresses on the cards in the United States.

Prophylactic Penicillin Study

Dr. Mariano Curiel Alcala, chief of the Institute of Social Hygiene at Mexicali, reported on a clinical study of 500 women exposed to the risk of venereal infection. The study demonstrated conclusively, he said, that routine weekly injections of 300,000 units of procaine penicillin in oil with aluminum monostearate prevents gonococcal infection. Extensive use of this procedure in certain Mexican cities, he said, is a major factor in inhibiting the transmission of venereal disease.

Bacillary Dysentery High in Texas

About 50 percent of the bacillary dysentery cases in the United States during 1956 occurred in Texas, according to Drs. J. E. Peavy, J. V. Irons, and W. D. Carroll, of the Texas State Department of Health. Also reported from the State were 16 percent of all cases of salmonellosis. While the estimated 159 cases of typhoid fever last year are a

sharp drop from the 443 reported in 1946, and the 918 cases in 1936, the 1956 figure constitutes a tenth of typhoid fever reports in the Nation.

They pointed out that the actual incidence of diarrheal disease is difficult to determine, since most cases, except those of typhoid fever, are not reported to authorities unless a marked increase prompts epidemiological investigation.

Group C *Salmonella*, including *S. oranienburg* and *S. newport*, were dominant among the 231 cultures of this genus identified in 1956 by public health laboratories and among the 48 cultures grown up to April 1957. Some of these organisms were frequently found in eggs. From January 1956 to March 1957, *Salmonella reading*, epidemiologically important in certain areas, was encountered only 3 times.

During this interval, *Shigella flexneri* was found 83 times; *Shigella sonnei* was cultured 13 times, and *Shigella boydii*, twice. Of the 12 cultures of *Shigella-Salmonella* from diarrheal disorders in the United States-Mexico border counties, 10 were found at Laredo or El Paso. A special study was conducted at Laredo during 1956-57.

Urges Renewed Effort For VD Control

Dr. Antonio Campos Salas, director, National Campaign Against Venereal Disease, Ministry of Health and Welfare, Mexico, cited official estimates for Mexico showing that more than 300,000 persons have syphilis and that 2,000 die annually from the disease. For gonorrhea the estimated number infected is about five times greater than for syphilis.

A series of serologic tests on large population groups revealed positive results among 4 to 8 percent of women given official prenatal services. Rates for laborers were 6 to 25 percent; farmers, 6 to 12 percent; military personnel, 11 percent; policemen, 10 to 25 percent; government employees, 5 to 12 percent; students and adolescents, 1 to 3 percent; and food handlers, 4 to 10 percent.

Intensive education of the public is part of the government program described by Campos Salas. Other features of the program are prophylactic treatment with delayed action penicillin and a move to coordinate efforts by physicians.

Case-Finding Skills Key to U. S. Program

Today 85 percent of all syphilis contacts in the United States are brought to examination, stated Warren T. Davis, health program representative of the Communicable Disease Center, Public Health Service, in Atlanta, Ga., in a review of the national venereal disease control program.

Groundwork for the first intensive case-finding campaign began in 1946, when the Public Health Service received requests from many States for workers skilled in interviewing for sex contacts, statistical analysis of data, and planning and conducting field studies. By 1949, training programs were set up in a number of States, as well as several with Federal cooperation.

Both civilian and military epidemiologists have traveled to these schools at Federal expense for clinical experience and interviewing and investigation under skilled guidance. The schools are pioneering the use of electronic devices for training purposes. A mobile training school also carries specialized training to staff members in venereal disease clinics across the country.

Techniques developed for interviewing patients reflect the fact that contracting a venereal disease is in itself a traumatic experience. The associated pattern of guilt, fear, and distrust in most patients calls for methods that create trust so that the patient names sex contacts and provides information sufficient to bring them to examination.

Monthly reports from workers in the field are used to evaluate activities and results. Control reports, dealing with morbidity, epidemiology, and special projects guide statisticians in advising administrators on current incidence. The statistical unit also publishes quarterly

Syphilis Morbidity Rises

Venereal disease continues to be a major public health problem in the United States. This is evidenced by the fact that in 1956, for the first time in 8 years, the total number of syphilis cases reported in the United States, 126,000, was larger than the previous year's total, which was 122,000. During this period, infectious syphilis cases also increased in 18 States and in the Nation as a whole. It is estimated that almost 2 million Americans are currently in need of treatment for syphilis. During 1955, the last year for which we have data, 1,700 persons were admitted to mental hospitals with syphilitic psychoses.

—DR. WILLIAM J. BROWN, chief, Venereal Disease Branch, Communicable Disease Center, Public Health Service.

statistical letters and an annual venereal disease fact sheet.

Davis illustrated how the constant pooling of therapy evaluation data by Federal health workers directly influences the program. Once the slow, absorptive forms of penicillin had been evaluated through therapy evaluation studies, the whole venereal disease control program was quick to shift from inpatient care at rapid treatment centers to clinical outpatient therapy.

A national program of serologic evaluation, he concluded, has led to gradual improvement in specificity, sensitivity, and reproducibility of standard serologic tests in public health laboratories.

Treponemal Antigen Production

Research in growing *Treponema pallidum* through new tissue culture techniques conducted at the Venereal Disease Experimental Laboratory, Communicable Disease Center, Chapel Hill, N. C., was described by Dr. Clarence A. Smith, deputy chief of the Communicable Disease Center. He also reported that the *Treponema pallidum* complement fixation test using a treponemal antigen has proved to be a practical diagnostic procedure for syphilis. Two firms are producing the antigen for commercial use. A parallel project at the CDC laboratory is directed toward producing an immunizing vaccine for syphilis.

Reporting on the program for finding and treating migrant farm workers with syphilis during the last half of 1955, he stated that 4,620

(13.2 percent) of the 35,000 tested were positive reactors and received penicillin treatment.

Antimalarial Progress in Mexico

An account of Mexico's full-scale campaign against malaria presented by Dr. Manuel E. Pesqueira, vice minister of health and welfare, brought out that about 2 million persons have malaria and about 5,000 die yearly of that disease in Mexico.

Reviewing achievements of the National Commission for Malaria Eradication, Pesqueira stated that a corps of 4,701 workers were trained during 1956 for full-time epidemiological work and spraying operations. The geographic frontiers of malarious areas, covering 61,594 localities, and the periods of seasonal transmission were determined, and with the close cooperation of private physicians blood samples were taken from 61,503 malaria suspects for parasitological examination.

Studies on *Anopheles pseudopunctipennis pseudopunctipennis*, *Anopheles albimanus*, and *Anopheles aztecus* in 65 localities demonstrated their great susceptibility to DDT in Mexico. Other studies in the State of Chiapas and in the chicler and woodworking camps in the Yucatan jungles are being conducted to determine whether spraying alone will provide protection against malaria.

A broad and methodical spraying operation opened with a geographic

reconnaissance of the malarious area, which was divided into 14 zones. In addition to recording the location of each house and the way to reach it, the study covered such features as the quality of the walls and surfaces to be sprayed. Within 6 months, maps were completed for 53 percent of the country and heliographic copies printed of localities, which for the most part represented spraying units.

Each house on every map was assigned a number. To ascertain individual output per sprayman, initial spraying was carried out in the fall of 1956, covering 452,904 houses. This operation illustrated that the average work potential per sprayman was nine houses in a day, varying according to motorized, mounted, or water brigade. On this basis, definitive spraying operations began in January 1957 with a target of 5½ million sprayings by the end of the year, enough to provide complete protection for inhabitants in malarious regions.

Pesqueira continued with a description of the public education phase of the program. Audiovisual units, he said, carry to each community the educational message it needs. Material includes pamphlets translated into 15 regional languages. Another feature of the education drive is enlisting the active participation of key people in the zones, who receive the title of "honorary aides of health education."

Parallel activities in research deal with susceptibility tests on insects and the breeding conditions and habits of anophelines. Pesqueira reported further that tests on insecticides are measuring their organoleptic features and other specifications. Lethal effects *in situ* are under study as are the effects of anti-malarial drugs.

Logistical plans encompass all data covering cartography, transportation, and evacuation. The main function of logistical personnel is to supply insecticides and equipment so that zone projects proceed on schedule. They also supervise and maintain 633 vehicles. For this purpose, zones are equipped with permanent and mobile workshops.

Yellow Fever Measures In the United States

ROBERT J. ANDERSON, M.D.

SINCE the last outbreak of yellow fever in the United States more than 50 years ago, only occasional cases have been reported, all contracted outside this country. The last incident of urban transmission occurred in 1906. No cases have been reported since 1924.

Yellow fever is not indigenous to the United States. It was introduced to the region in the 17th century, causing frequent devastating epidemics for more than 200 years. In fact, an epidemic of yellow fever stimulated the establishment of one of our State health departments in 1855. After aggressive measures cleared up the problem a half century ago, urban yellow fever has remained under control through a combination of quarantine measures and improved sanitation.

Our natural environment favors us to some extent with regard to jungle yellow fever; although a mosquito vector, *Haemagogus*, is known to be present in one area of the United States, the monkey host is not native to our country.

We are fully aware, however, that yellow fever cannot be disregarded as a potential hazard. Modern means of transportation make it possible for a person to acquire yellow fever in an endemic area and to reach the United States within the incubation period of the disease. Against this eventuality we are continually on guard.

Precautionary Measures

Medical officers of the Division of Foreign Quarantine, Public Health Service, examine travelers to the United States who show signs

of illness which might be yellow fever. Precautions are also taken to prevent the importation of infected animals. Pursuant to the International Sanitary Regulations of the World Health Organization, the division carries on a program of mosquito control and surveillance on carriers and around international airports and piers of seaports, as well as at border crossing points in receptive areas.

As a further safeguard against the free travel of insect vectors from one country to another, our foreign quarantine regulations require that airplanes, ships, and certain other vehicles on international routes be treated with insecticides. Technologists of the Communicable Disease Center are engaged in studies to improve such insect control measures.

A very important measure in the international control of yellow fever is vaccination. According to our foreign quarantine regulations, vaccination is required for persons leaving an infected area and proceeding to the United States. The United States recommends vaccination for travelers to all areas where exposure to yellow fever is a possibility. The Division of Foreign Quarantine is responsible for yellow fever vaccination centers in this country.

In addition, the Public Health Service keeps watch on *Aedes aegypti* mosquitoes in the portion of this country where they are known to be present, roughly, the area south of a line drawn from southern Virginia westward through northern Oklahoma and then southwestward to El Paso, Tex. During the Second World War, anti-*aegypti* campaigns were held in several cities in this area, principally in ports of entry. Data from a survey made in 1952 of 16 of these cities and 12 others in the *aegypti* area indicated a marked lessening of the *aegypti* population. Another survey made by the Communicable Disease Center in 1956 indicated a continued downward trend. General sanitation programs, which have eliminated breeding places, and increasingly common use of insecticides, as well as campaigns against mosquitoes generally, have contributed to reducing the density of this species.

Study Projects

Under conditions prevailing through most of the past 50 years, current precautions would

Dr. Anderson is Assistant Surgeon General, Public Health Service, and serves as chief, Communicable Disease Center, Atlanta, Ga. This paper is based on an address given at the United States-Mexico Border Public Health Association meeting in San Antonio, Tex., during April 1957.

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Study Projects

Under conditions prevailing through most of the past 50 years, current precautions would

probably suffice. Recent changes in the international picture of yellow fever, however, call for sharpened alertness. Jungle yellow fever has been found in many places in South and Central America, and a number of human cases have been reported in these areas in the past 10 years. In the light of these circumstances, we now have under way projects which will put us in a more favorable position to deal with new yellow fever problems if they arise. Surveys now being made in the historic yellow fever receptive areas, to determine the distribution and density of *A. aegypti*, will provide data for more accurate definition of the present problem area.

Because extensive programs to eradicate the *A. aegypti* mosquito specifically have not been attempted in the United States—only one city has been covered by an *aegypti* eradication campaign—we do not know if such programs are practical in our country. We have no way of determining whether methods successful in other countries are applicable here. We therefore hope to conduct a demonstration eradication project in a representative city in the *A. aegypti* zone. This includes inspection of premises, elimination of breeding places, and the application of insecticides; repeat visits will be made—with decreasing frequency as the area under control is extended and as areas remain free of *aegypti* mosquitoes.

While we have had no reports of yellow fever in the United States, it is possible that the disease has been present in a mild form that has escaped notice. The experience in Trinidad in 1953, when serologic tests indicated that yellow fever had occurred unnoticed 20 years previously, emphasizes this possibility. As a part of its surveillance program, the Communicable Disease Center is planning serologic surveys in areas where importation and transmis-

sion of yellow fever have been most likely in order to provide some estimate of exposure experience.

Studies at the Communicable Disease Center on the susceptibility of indigenous mosquito species to infection and their ability to transmit the virus will add to our ability to evaluate the likelihood of yellow fever transmission under both rural and urban conditions. Work is going forward in the Communicable Disease Center laboratory toward developing rapid diagnostic methods for yellow fever and other tropical virus diseases in which a number of relatively new techniques, such as tissue culture, are being explored.

Other Public Health Service research plans for overall studies of arthropod-borne viruses are now in the formative stage at the National Institutes of Health. These studies will be carried on at a basic laboratory in Bethesda, Md., in the Laboratory of Tropical Diseases, and at a field laboratory in the Canal Zone under the joint auspices of the Institutes and the Department of Defense. They will supplement the distinguished work of the Gorgas Memorial Laboratory in this field. As presently planned, the new project will have a permanent staff in the Canal Zone, and will provide space for visiting groups working on problems of mutual interest. Preliminary work is under way in Guatemala, where a staff member from the Laboratory of Tropical Diseases was assigned for liaison between the laboratory in the Canal Zone and field activities in Guatemala. Also involved in the work in Guatemala will be the Pan American Sanitary Bureau and the Gorgas Memorial Laboratory.

This work will help to preserve and improve professional competency in recognizing yellow fever in animals, diagnosing it in humans, and controlling the insect vectors responsible for its transmission.

Long-Time Trends in Illness and Medical Care

THIS STUDY is devoted largely to several indexes of illness, medical care and mortality in various population groups. Trends of mortality in the civilian population are shown by age, for all causes, and by important causes, for all ages.

Comparisons of urban and rural residents with respect to illness, hospital care in short-term hospitals, and also in long-term mental and tuberculosis hospitals, are made for certain places. In war and postwar periods, Federal hospitals carry a considerable load of care of men in the armed forces and veterans of those forces.

Data are shown for (a) relative age variation of illness for many specific acute and chronic diseases and (b) relative seasonal variation of illness from disease groups and specific diseases. For the chronic diseases, these age and seasonal variations are shown in terms of acute exacerbations or attacks of the disease.

Mortality from disease and accident (exclusive of battle casualties) in the armed forces during the past century follows the same general trend as mortality among civilian males of comparable ages. Obviously, mortality rates for civilians of all ages would be higher than for the armed forces, because the great majority of those forces are young men of the healthy ages, who have been carefully examined for disease, physical impairments, and mental and neurological abnormalities before being taken into the services. However, mortality rates from disease only, exclusive of all accidents and battle casualties, are higher among civilians of comparable ages than among the armed forces, presumably because the diseased and the impaired are rejected in the entrance physical examinations.

Life expectancy at birth in the United States

has increased in the last half-century from 49 to 69 years, an addition of 20 years to the average life expectancy. Another figure of equal interest which can be obtained from life tables is the proportion of persons in a cohort of 100,-



Public Health

MONOGRAPH

No. 48

The accompanying summary covers the principal findings presented in Public Health Monograph No. 48, published concurrently with this issue of Public Health Reports. The author is with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Collins, Selwyn D.: A review and study of illness and medical care, with special reference to long-time trends. Public Health Monograph No. 48 (Public Health Service Publication No. 544). 86 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1957.

000, that is, persons who are assumed for purposes of computation to have been born alive at the same instant of time, who are still living at different ages. For example, according to the life table based on 1953 mortality, 97 percent of these infants would be alive at the end of their first year, but only 87 percent according to the 1900-1902 (1901) table; at 50 years of age, 89 percent would still be alive according to the 1953 table, compared with 59 percent by the 1901 table; and at 85 years, 17 percent would be alive by the 1953 table, but only 6 percent by the 1901 table. Thus, at approximately present mortality rates, nearly three times as many people will reach 85 years of age than would reach that age at death rates of 50 years ago.

First admission rates per 1,000 population to State mental hospitals in New York have increased since 1900 in about the same proportion as heart disease death rates in the total United States. Compared with the increase in heart diseases, noninfectious disease mortality exclu-

sive of heart diseases has increased only gradually.

Of 7 major causes of first admissions to State mental hospitals in New York, 5 have increased considerably since 1925, but the other 2 have decreased markedly. Of the same 7 diagnoses, 3 are higher for women than for men (senile, manic-depressive, and involutional psychoses). First admission rates for alcoholic psychosis and general paresis are much higher for men than for women, and cerebral arteriosclerosis rates are somewhat higher for men. Schizophrenia rates were slightly higher for men up to about 1950, but the reverse is true for the years since that time.

First admissions of epileptics to institutions for their care in New York State decreased from 2.5 to 1.4 per 100,000 population, or 44 percent, in the 18 years from 1933 to 1951; but first admission rates of mental defectives decreased only from 9.1 in 1930 to 7.9 per 100,000 in 1951, or only 13 percent.

Traineeships in the Rehabilitation of the Blind

A limited number of traineeships in rehabilitation of the blind are offered by the Industrial Home for the Blind, Brooklyn, New York. Each traineeship amounts to \$50 per week. There is no tuition fee.

The training program, developed by the Industrial Home for the Blind in cooperation with the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, combines academic and field experience into 20-week and 40-week courses for the preparation of vocational counselors and other vocational specialists serving the blind.

In order to qualify for traineeships, applicants must have a bachelor's degree from a recognized university or the equivalent in training and experience. They must have a clear vocational goal in work for the blind as well as emotional stability and personal readiness for professional training. Blind applicants are expected to have mastered the essential tools of learning without sight—self-travel, typing, braille, and the use of recording equipment.

Application blanks and further information may be obtained by writing to Dr. Herbert Rusalem, Director of Professional Training, Industrial Home for the Blind, 57 Willoughby Street, Brooklyn 1, New York.

Mortality from Snakebites, United States, 1950-54.

HENRY M. PARRISH, M.D., M.P.H.

POISONOUS snakebites in the United States are by no means rare. However, few studies indicate the incidence of poisonous snakebites in a given region or State, and no studies give the actual death rate in this country resulting from poisonous snakebites alone.

The estimate by Githens, quoted by Porges (1) and others, of 2,000 to 3,000 snakebite accidents a year in the United States is based on such sources as news clippings and is possibly far too low.

Swaroop and Grab (2) pointed out the importance of snake venom poisoning throughout the world. They estimated that 30,000 to 40,000 deaths occur annually from this cause. The same authors estimated that there are from 10 to 20 deaths from snakebites in this country each year.

One of the major difficulties in a study of snakebite deaths is that the International Statistical Classification of Diseases, Injuries, and Causes of Death classifies snakebites under E927 with "accidents caused by bites and stings of venomous animals and insects." Included in this classification are the bites or stings of centipedes, scorpions, bees, wasps, snakes, and other venomous animals. The purpose of this study is to determine the death rate from poisonous snakebites in the various States, to discover what kinds of snakes cause most of the fatal bites, and to study other pertinent medical facts related to these deaths.

Two families of poisonous snakes inhabit the United States: the Crotalidae, or pit vipers, and the Elapidae, or coral snakes. Of the pit vipers, the genera found in this country are the

Crotalus, or rattlesnakes, the *Agkistrodon*, or moccasins (including the water, or cottonmouth, moccasin, and the copperhead, or highland, moccasin), and the *Sistrurus*, or ground rattlers. At least one species of poisonous snake has been reported to inhabit each State in this country.

Death Reports

A list of the deaths, 71 in all, resulting from the bites of poisonous snakes in the United States during the 5-year period 1950-54 was obtained from the National Office of Vital Statistics, Public Health Service. This list contained the number of the death certificate, the date of death, and the State in which death occurred. A copy of each death certificate was then obtained from the appropriate State health department. Since the death certificates did not record all the information considered important for this study, I mailed a followup letter with a questionnaire to each physician, coroner, or other official who signed the death certificate. Of the 71 mailed, 53 questionnaires were returned. This report is based on the analysis of the 71 certificates listing poisonous snakebite as the cause of death and the 53 questionnaires.

Projections from this small sample are of doubtful value, but they are offered for want of a better base. They indicate an average of approximately 14 deaths per year and an average death rate of 0.09 per 1,000,000 population for the entire country.

The number of fatal bites and the death rates for the individual States are shown in the table. The death rates, reported as deaths per 1,000,000 population, were highest in the following States: Arizona, 1.15; Florida, 0.65; Georgia, 0.63; Texas, 0.44; and Alabama, 0.32.

Of the 71 victims of poisonous snakebites, 53 were male and 18 female. The high proportion of deaths among males probably reflects their increased exposure owing to recreational habits and to occupations out of doors.

As shown in the following tabulation of deaths according to age, 39 percent of the deaths occurred in youngsters less than 15 years old. A study of the incidence of poisonous snakebites in Florida found that 49 percent of all

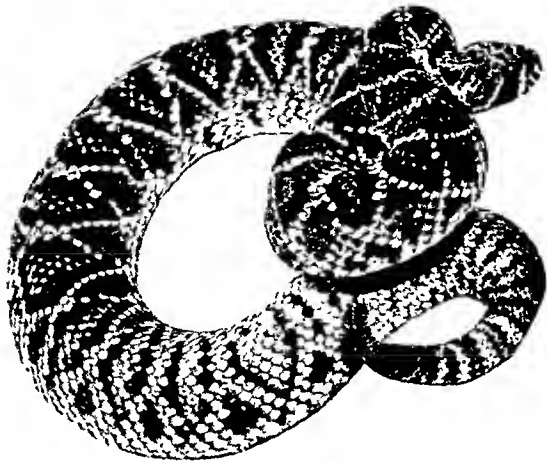
Dr. Parrish is a research fellow in epidemiology and biometry at the University of Pittsburgh Graduate School of Public Health, Pittsburgh, Pa. He was formerly at Yale University in the department of public health.

the bites were experienced by children or youths less than 20 years of age (3). The large number of deaths in this age group is consistent with the observation that the ratio of units of venom injected to units of body weight is greater in children. Evidently, susceptibility to snake venom poisoning is greater in both extremes of life, for approximately 32 percent of the deaths were in persons 50 years old or more.

| Age (years) | Number of deaths |
|-------------|------------------|
| 0-4 | 16 |
| 5-9 | 7 |
| 10-14 | 5 |
| 15-19 | 3 |
| 20-29 | 3 |
| 30-39 | 7 |
| 40-49 | 7 |
| 50-59 | 15 |
| 60-69 | 4 |
| 70 and over | 4 |

The occupational groups suffering most fatalities from snakebite were the following: agricultural workers, 25; other out-of-doors workers, including woodsmen, common laborers, and highway workers, 15; preschool children, 16; school children, 11; and housewives, 7. Closely related to the victim's occupation was his activity at the time of the fatal bite. Although the activity was not stated in 21 instances, of the other 50, 15 persons were bitten while working on a farm, 9 were bitten while engaged in other out-of-doors work, 16 children were bitten while playing near their place of residence, 8 persons were bitten while handling or trying to kill a snake, and only 2 were bitten while engaged in recreation. Of the 8 persons bitten while handling a poisonous snake, 5 were engaged in religious ceremonies in Kentucky and Alabama. The Kentucky State Board of Health reported 7 snakebite deaths resulting from religious snake handling between 1940 and 1955. Several of these victims refused treatment until it was too late.

The months during which fatal snakebites were most frequent were: June, 6; July, 10; August, 14; and September, 11. There was a gradual increase in the number of deaths beginning in March and reaching a peak during August and September. This seasonal distri-



Eastern diamondback rattlesnake (*Crotalus adamanteus*), one of the most dangerous snakes indigenous to the United States.

bution has been observed in other surveys of snakebites (3-5).

Crotalus species cause most of the fatal snakebites in the United States: Rattlesnakes accounted for 55 of the 71 deaths in this study. Cottonmouth moccasins were responsible for 2 deaths, and a coral snake caused 1. Two other deaths were attributed to unknown species of pit vipers. The offending reptile was not identified in the remaining 11 deaths. The large rattlesnake species and the cottonmouth moccasins more frequently produce cases of severe envenomation than do copperhead moccasins and ground rattlesnakes. Coral snakes, though quite poisonous, are not as aggressive as the pit vipers, and they have a much more limited geographic range.

Site of Bite

Snakes most frequently bite the extremities. In this study, 37 (52 percent) of the patients were bitten on the lower extremities, and 26 (37 percent) were bitten on the upper extremities. One patient was bitten on the face, and another was bitten on the thorax. For six patients, information about the site of the bite could not be obtained. Three patients suffered from two or more bites from the same snake. Physicians attending three other patients reported that the venom was injected directly into the blood stream through veins in the legs. This in-

travenous injection of the venom, rather than the usual lymphatic and subcutaneous spread, probably produced death despite heroic treatment. Four other patients were bitten on the proximal portion of an extremity, which allowed for more rapid dissemination of the venom into the body. The other fatal snakebite wounds did not differ from the majority of wounds reported in nonfatal snakebites (3, 4).

The interval between the time of the snakebite and the time of death is given below. Contrary to popular expectation, few patients died within the first hours following a bite. Thirty-five (49 percent) of the patients expired from 6 to 18 hours after becoming envenomated. In this period, the venom is absorbed into the body and exerts its maximum toxic effects. Of the patients who died 3 or more days following the bite, 3 died either from infection or gangrene, or both, and 1 died from a transfusion reaction.

| <i>Time Interval</i> | <i>Number of deaths</i> |
|----------------------|-------------------------|
| 0-1 hours..... | 3 |
| 2-5 hours..... | 10 |
| 6-11 hours..... | 19 |
| 12-18 hours..... | 16 |
| 19-24 hours..... | 6 |
| 25-48 hours..... | 9 |
| 3 days..... | 2 |
| 6 days..... | 2 |
| 7 days..... | 1 |
| 10 days..... | 1 |
| Unknown..... | 2 |

Attending physicians were asked to check a list of remedies and measures used for treatment. In most instances, the treatment conformed to current recommended practices. It included the use of a tourniquet with incision and suction (6), and administration of antibiotics, tetanus antitoxin, and antivenom (7).

A factor which certainly cost many lives was the long interval between the time the patient was bitten and the time treatment was begun. The interval before treatment was less than 1 hour for 14 patients; from 1 to 4 hours for 19 patients; from 5 to 7 hours for 9 patients; from 8 to 10 hours for 3 patients; from 11 to 17 hours for 4 patients; from 18 to 24 hours for 2 patients; and more than 24 hours for 2 patients. Thus, approximately 36 percent of these 53 patients were seen 4 or more hours after the bite.

Information concerning the timelag before treatment was not available for 18 patients.

In my experience and from analyzing 241 nonfatal snakebites in Florida, approximately 65 percent of the patients were seen within 2 hours after the bite, and approximately 95 percent were seen within 4 hours. The lag before treatment in the fatal bites gives the venom ample time for absorption into the body and reduces the effectiveness of a tourniquet, incision, and suction. Failure to seek prompt medical attention is attributed to ignorance or religious bias. Many others, especially children, were vulnerable because they lacked boots, long trousers, or other protective clothing. The most important measure to prevent death from snakebite is prompt and vigorous treatment of the wound.

Summary

An analysis of 71 deaths from poisonous snakebites in the United States during the

Deaths from poisonous snakebites in the United States, 1950-54

| State | Total deaths | Average deaths per year | Average deaths per 1,000,000 population ¹ per year |
|---------------------|--------------|-------------------------|---|
| Arizona..... | 5 | 1.0 | 1.15 |
| Alabama..... | 5 | 1.0 | .32 |
| Arkansas..... | 2 | .4 | .22 |
| California..... | 7 | 1.4 | .12 |
| Florida..... | 10 | 2.0 | .65 |
| Georgia..... | 11 | 2.2 | .63 |
| Kentucky..... | 2 | .4 | .14 |
| Louisiana..... | 1 | .2 | .07 |
| Mississippi..... | 2 | .4 | .19 |
| Missouri..... | 1 | .2 | .05 |
| New Mexico..... | 1 | .2 | .27 |
| North Carolina..... | 1 | .2 | .05 |
| Oregon..... | 1 | .2 | .12 |
| South Carolina..... | 2 | .4 | .18 |
| Tennessee..... | 1 | .2 | .06 |
| Texas..... | 18 | 3.6 | .44 |
| Nebraska..... | 1 | .2 | .15 |
| Total..... | 71 | 14.2 | 2.09 |

¹ Estimated 1952 population for each State published by the U. S. Bureau of the Census in its Current Population Reports, Series P-25, No. 97, 1954.

² Based on total 1952 population for the United States.

period 1950-54 found the highest death rates in Arizona, Florida, Georgia, Texas, and Alabama.

The most frequent victims were under 15 or over 50 years of age. Most of the victims were workmen occupied out of doors or children playing around their residence. Rattlesnake species inflicted at least 77 percent of the fatalities, 90 percent of those for which the species was identified.

The bites of the wounds were predominantly on the extremities: 52 percent on the lower and 37 percent on the upper.

The most important factor in the failure of these patients to survive was the interval between the time of the bite and the time of medical treatment. Other important factors were the large number of rattlesnake bites, the age and weight of the victims, and the nature and location of the wounds.

Early and vigorous treatment of all severe cases of snake venom poisoning is recommended.

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Study of Fallout Effects in Laboratory Animals

A method for duplicating and studying the effects of radiation fallout in laboratory animals has been developed by a Defense Department research team. Col. Carl F. Tessmer and Capt. Frank L. Jennings of the Armed Forces Institute of Pathology described this development as a further step in the study of these effects on humans, in a paper presented before the joint sessions of the American Society of Clinical Pathologists and the College of American Pathologists on October 4, 1957.

In their experiments, skins of pigs, which are closely similar to human skins, were exposed to large doses of electron beams from an atom smasher made available by the National Institutes of Health, Public Health Service. Resulting skin lesions, they reported, duplicated lesions produced by fallout, with early pigmentation of the skin followed by a breakdown in skin tissues.

The investigators used a segment of the electron beam from the atom smasher—two energies of the beta rays—that most nearly reproduces fallout in range and effects. They pointed out that this study should permit closer examination of both immediate and long-range effects of various radiation dosages.

Comparison of Stool Collection Techniques in Amebiasis Investigations

KATHLEEN HARPER, B.S., MAURICE D. LITTLE, B.S., and A. L. MARSHALL, JR., M.D.

OUTBREAKS of amebiasis occur unexpectedly and sporadically, and their investigation presents laboratory problems of considerable magnitude. The average diagnostic laboratory has a minimal staff of parasitologists and is unprepared to examine large numbers of stools. Furthermore, routine diagnostic procedures may not be suitable for use in field studies.

Since an investigation of amebiasis should include the detection and identification of both trophozoites and cysts of *Entamoeba histolytica*, freshly passed stools should be submitted to the laboratory only as rapidly as they can be examined. To do this may require setting up a laboratory near the area of investigation and arranging for the services of additional parasitologists.

In Indiana, the State board of health laboratories have been unprepared to provide all the services needed during outbreaks of amebic dysentery. Major difficulties have been insufficient time to make preparations for increased laboratory services, a parasitology staff already fully engaged in normal functions of the laboratory, coordination of the field investigation and laboratory programs so that specimens received at the laboratory while still fresh or adequately preserved would arrive no faster than examiners could handle them, and employment of efficient and feasible parasitological techniques.

In this study, an effort was made to establish a diagnostic procedure which would be readily applicable in epidemiological investigations of amebiasis and which would minimize the difficulties of laboratory participation.

Routinely, stool examinations are made on specimens submitted in polyvinyl (PVA) fixative two-bottle stool collection outfits (1, 2). While these techniques were effective for diagnostic purposes, their performance was too complex for use in extensive investigations of amebic dysentery. The stain preservation technique (3) using merthiolate, iodine, and formalin (MIF) and the MIF concentration technique (4) showed promise as a survey tool for investigation of sporadic outbreaks of amebic dysentery.

Use of these two techniques in several small surveys for *E. histolytica* gave such favorable results that a comparative study was made of this procedure and of the PVA fixative two-bottle stool collection-examination method. The results of this comparison and the manner of application of the MIF and MIF concentration techniques in an emergency investigation of a possible outbreak of amebic dysentery are presented in this report.

Methods

Specimens were obtained from inmates of a State mental institution. One stool per patient was collected. For each patient, the attendants

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were provided with an empty bottle for an unpreserved portion of the stool, a bottle of prepared PVA fixative solution, and a bottle for the collection of the MIF-preserved stool. The attendants added an appropriate amount of each freshly passed stool to each bottle. Specimens were collected twice a week and promptly transported to the laboratory. Since unpreserved stools were included in this series, specimens were collected only as rapidly as the examiners could handle them. Altogether, 110 specimens of 3 stool portions each were obtained.

Collection Techniques

In the PVA fixative two-bottle collection method, one portion of each freshly passed stool, about the diameter of a quarter, was placed in an empty bottle. In another bottle, an equal quantity of feces was thoroughly mixed with the PVA fixative solution to approximate a mixture of 1 part feces and 2 parts preservative. This method (2) was used to prepare the first two portions of the fecal specimens, and an equal amount of each specimen was mixed with MIF solution in a third bottle.

The MIF stain preservative consists of a stable stock merthiolate formalin (MF) solution and Lugol's iodine solution. These solutions were prepared in quantities sufficient to complete the study, dispensed separately, and combined in aliquot proportions by the persons collecting the stools. The stock MF solution (3) was prepared by mixing 250 ml. of distilled

water, 200 ml. of tincture merthiolate No. 99, 1:1,000 (Lilly), 25 ml. of solution formaldehyde U.S.P., and 5 ml. of glycerine, and dispensed at 14.1 ml. per collection bottle. The Lugol's stock 5 percent iodine solution was stored in the refrigerator in a brown glass bottle and dispensed as needed, 0.9 ml. per cork-stoppered 13x75 mm. test tube.

One bottle of MF solution and one test tube of Lugol's iodine solution were provided for each specimen to be submitted in MIF preservative. Immediately after passage of the stool, the attendant added one aliquot of iodine to one bottle of MF solution, then added the appropriate amount of feces, and mixed them thoroughly.

Examination Techniques

As the specimens arrived at the laboratory, each set of three stool portions was examined by the following techniques:

Technique 1. At least 1 saline and 1 Lugol's iodine wet mount were examined from different areas of each specimen of unpreserved stool; additional amounts were examined only when necessary to identify species.

Technique 2. Each unpreserved specimen was also examined by the zinc sulfate concentration technique described in an earlier report (2).

Technique 3. Routinely, only one fecal film from each PVA fixative preserved stool was permanently stained with iron hematoxylin. When necessary for identification of protozoa, 1 or

Table 1. Number of times protozoa were found in 110 stools and methods of detection

| Protozoa | Combined methods | Unpreserved stools | | PVA fixative stools | MIF stools | |
|------------------------------------|------------------|--------------------|------------------------|---------------------------|------------------|------|
| | | Direct wet mount | Zinc sulfate flotation | Hematoxylin stained smear | Direct wet mount | MIFC |
| <i>Entamoeba histolytica</i> | 32 | 10 | 10 | 21 | 19 | 27 |
| <i>Entamoeba coli</i> | 76 | 44 | 58 | 43 | 55 | 70 |
| <i>Iodamoeba bütschlii</i> | 1 | 0 | 0 | 1 | 1 | 0 |
| <i>Endolimax nana</i> | 44 | 16 | 14 | 34 | 24 | 27 |
| <i>Giardia lamblia</i> | 5 | 5 | 2 | 4 | 4 | 4 |
| <i>Chilomastix mesnili</i> | 30 | 12 | 7 | 27 | 18 | 23 |
| <i>Trichomonas hominis</i> | 1 | 1 | 0 | 1 | 1 | 1 |
| Unidentified protozoa..... | 19 | 9 | 8 | 5 | 6 | 6 |
| Total..... | 208 | 97 | 99 | 136 | 128 | 158 |

2 additional smears were examined. This technique is also described in the earlier report (2). A fecal smear was prepared on a 75×25 mm. glass slide, dried overnight, and stained with a modification of the Tompkins-Miller rapid iron hematoxylin phosphotungstic acid method (5). If the protozoa could not be identified, additional smears were stained by the Heidenhain long iron hematoxylin method.

Technique 4. At least one direct wet mount from each MIF-preserved stool was examined. A drop of fecal suspension was placed on a glass slide and a coverslip was added. If the suspension was too thick for good visibility, the drop of material was mixed with a drop of saline. With a few exceptions, no additional staining was necessary, although an additional smear was occasionally prepared in a drop of Lugol's iodine or MIF stain formula for the direct smear technique in order to bring out the iodine phase or to enhance specific differential structures.

Technique 5. The merthiolate-iodine-formaldehyde concentration technique (MIFC) developed by Blagg and associates (4) for use with MIF-preserved stools was performed on all stools received in MIF. The steps in this procedure follow:

1. Shake the specimen vigorously for about 5 seconds. If mixture appears too viscous to strain easily through gauze, dilute with stock MF solution before shaking.

2. Strain mixture through two layers of wet gauze into a lipless conical paper cup and immediately pour 10 ml. into a 15-ml. graduated centrifuge tube.

3. Add 4 ml. of ether, stopper and shake vigorously. If ether remains on top, add 1 ml. of tap water and reshake.

4. Remove stopper and let stand 2 minutes.

5. Centrifuge for 1 minute at 1,600 r.p.m. Four distinct layers should appear: a top layer of ether, a plug of fecal detritus, an MIF layer, and a small amount of sediment.

6. Loosen the fecal plug by ringing with an applicator stick. Quickly pour out all but the bottom layer of sediment.

7. Mix the sediment and make a coverslip preparation. Slide the coverslip over the drop of sediment, so that coarse particles remain outside the periphery while the fluid and any parasites run underneath the coverslip.

All examinations were made by two parasitologists, with cross-checking for identification purposes.

Results

In the combined examinations of 110 stools, protozoa were found 208 times (table 1). *E. histolytica* was found 32 times and other protozoa 176 times. Ten pinworm infections were found; however, since this report is concerned with protozoa only, these data are not included. Thirteen *E. histolytica* organisms were of the small race type; 19 protozoa were not specifically identified by examination of a single specimen.

The relative efficiency of the techniques for all protozoa ranged from 46.6 percent for direct wet mounts of unpreserved stools to 76.0 percent for the MIF concentration technique; for *E. histolytica* only, from 31.2 to 84.4 percent, respectively. The second most efficient single technique was the PVA fixative hematoxylin stained fecal smear, which yielded 65.4 percent of the total protozoa and 65.6 percent of the *E. histolytica*.

Efficiency of Combinations of Methods

The diagnostic yields of combinations of techniques are shown in table 2. The triple combination of hematoxylin stained PVA fixative smears, direct wet mounts from MIF-preserved stools, and the MIF concentration technique yielded all 32 *E. histolytica* and missed only 3 of the 189 specifically identified protozoa. However, the hematoxylin stained fecal smears plus the MIF concentration technique missed only 1 *E. histolytica* (large race) and 4 other protozoa (1 *Entamoeba coli*, 2 *Endolimax nana*, 1 *Giardia lamblia*). Only 34.4 percent of the *E. histolytica* and 62.4 percent of the other protozoa species could have been reported from examinations of the unpreserved stools alone.

Tables 1 and 2 would seem to indicate that when only one technique can be employed, the MIF concentration method is preferable. However, if two techniques can be used, the combination of MIF concentration and hematoxylin stained PVA fixative fecal smears appears to be so efficient that the addition of any

Table 2. Number of times protozoa were found and identified by combinations of techniques

| Technique | Total protozoa | <i>Entamoeba histolytica</i> race type | | | Other protozoa |
|---|----------------|--|-------|------|----------------|
| | | Large | Small | Both | |
| Saline and iodine direct wet mount ¹ | 109 | 11 | 0 | 11 | 98 |
| Zinc sulfate flotation ¹ | | | | | |
| Saline and iodine direct wet mount ¹ | 168 | 15 | 8 | 23 | 145 |
| Zinc sulfate flotation ¹ | | | | | |
| Hematoxylin stained fecal smear ² | 158 | 15 | 12 | 27 | 131 |
| Zinc sulfate flotation ¹ | | | | | |
| MIF concentration ³ | 184 | 18 | 13 | 31 | 153 |
| Hematoxylin stained fecal smear ² | | | | | |
| MIF concentration ³ | 162 | 16 | 12 | 28 | 134 |
| Direct wet mount ³ | | | | | |
| MIF concentration ³ | 163 | 19 | 9 | 28 | 135 |
| Hematoxylin stained fecal smear ² | | | | | |
| Direct wet mount ³ | 186 | 19 | 13 | 32 | 154 |
| Hematoxylin stained fecal smear ² | | | | | |
| Direct wet mount ³ | 189 | 19 | 13 | 32 | 157 |
| MIF concentration ³ | | | | | |
| All techniques | 189 | 19 | 13 | 32 | 157 |

¹ Unpreserved stool.

² PVA fixative preserved stool.

³ Merthiolate, iodine, and formalin preserved stool.

of the other techniques would be unnecessary. The MIF direct wet mount technique would appear to be of little additional value in detecting protozoa since the combined MIF direct wet mount and the MIF concentration technique did not significantly increase the number of protozoa found by the MIF concentration method alone.

Trophozoites and Cysts

Trophozoites and cysts when found were recorded for each specimen examined and for each technique employed (table 3). The MIF concentration and hematoxylin stained fecal

smear techniques gave comparable results for *E. histolytica* trophozoites. The former appeared less efficient for other trophozoites. However, frequently when trophozoites alone were encountered in the stained fecal films, both cysts and trophozoites were found by the MIF concentration technique. This technique appeared highly efficient for cysts of *E. histolytica* and other protozoa.

In MIF-preserved stools, because of the clearing and staining qualities of the preservative, *E. histolytica* cysts were as easily identified, and, of course, more easily found, in concentrated specimens as in stained PVA fecal films. *E.*

Table 3. Number of times protozoan cysts and trophozoites were found and identified by each examination technique

| Technique | All protozoa | | <i>E. histolytica</i> | | Other protozoa | |
|---------------------------|--------------|-------|-----------------------|-------|----------------|-------|
| | Trophozoites | Cysts | Trophozoites | Cysts | Trophozoites | Cysts |
| Direct wet mount | 4 | 84 | 0 | 10 | 4 | 74 |
| Zinc sulfate flotation | 1 | 91 | 0 | 10 | 1 | 81 |
| Hematoxylin stained smear | 90 | 76 | 14 | 14 | 76 | 62 |
| MIF direct wet mount | 51 | 90 | 8 | 14 | 43 | 76 |
| MIF concentration | 62 | 126 | 13 | 23 | 49 | 103 |
| All techniques | 101 | 153 | 18 | 27 | 83 | 126 |

histolytica trophozoites were easily identified in MIF-preserved stools, although perhaps not as easily as in the stained PVA fecal films. In preparations from MIF-preserved stools the nuclei and cytoplasm of *E. histolytica* cysts and trophozoites and the chromatoidal bodies of the cysts were clearly visible in the majority of organisms present in any one specimen; the small race *E. histolytica* was exceptionally easy to identify.

Trophozoites of other protozoan species, especially of flagellates, were usually easily identified. Occasionally, there was some hesitancy in specifically identifying the trophozoites of *E. nana* and *E. coli*. Although *Dientamoeba fragilis* was not encountered in this study, observations made with other groups of MIF-preserved stools have shown that *D. fragilis* trophozoites can be identified without too much difficulty after some experience with this species. On the other hand, the protozoan cysts rarely presented any difficulty of identification. Pseudopodia of ameba were frequently present in preparations made from the concentrated MIF specimens and were even more obvious in direct wet mounts made from the unconcentrated specimen. Protozoan cysts are most easily detected by scanning saline wet mounts made from unpreserved stools. However, after experience with wet mount preparations made from MIF-preserved specimens, the cysts are almost as easily found in the latter type of stool.

Application of MIF Technique

Results of the comparative study of methods and the use of the MIF stain preservative method of collecting stools in amebiasis investigations appear to justify planning for this type of stool collection.

The first opportunity to employ this technique in an emergency occurred during the summer of 1956. The diagnosis of three cases of amebiasis among the faculty of a college in northwestern Indiana resulted in a request from college officials for a sanitary survey. The Indiana State Board of Health received this request between the termination of summer school and the beginning of the fall semester. Engineers made a thorough inspection of all plumbing and sanitary installations and sanitarians

inspected kitchens and food storage facilities. Although both reports were satisfactory, it seemed advisable to make examinations of stools from the resident faculty, food handlers, and other permanent employees and to take necessary remedial measures before arrival of the students in the fall. It was felt that at least 3 stools from each of the 125 persons involved should be examined.

Basic plans of procedure were devised in consultations among representatives of the college and of the State board of health. With the MIF stool collection technique the field investigators were able to obtain epidemiological data and to collect specimens independently of the laboratory program, thus reducing considerably the time between the request for an investigation and the receipt of specimens in the laboratory.

MIF collection kits were assembled as described under "Methods." To prevent absorption of iodine, the cork stoppers for the test tubes of iodine solution were coated with paraffin. Applicator sticks for adding and mixing the specimens and detailed instruction sheets for the use of investigators were included in the collection kits.

The investigators obtained the history of each person and supplied him with 3 collection kits, with instructions that a stool be collected every 3 or 4 days and that the 3 specimens be delivered together to the college dispensary. The first, second, and third stools were taken to the laboratory in separate cartons. Since approximately half the persons in the study were away on vacation, two collections were made, the second several weeks after the first.

In the laboratory, all specimens were numbered and recorded. Assembly line methods were used in preparing them for examination. During the processing, the first, second, and third stools from each person were kept in separate groups. Individuals from other laboratory units were assigned to the project for brief periods during each step of the processing.

The first specimens were concentrated by the MIF concentration technique, with the aid of one technician. The centrifuge tubes were tightly stoppered and stored in the refrigerator until the sediment could be examined by the parasitologists. Examination of approximately

half of these concentrates indicated that very few would be positive for *E. histolytica* and that all three stools from nearly every person in the study probably would need to be examined. The second and third specimens were then concentrated and stored in the refrigerator.

The assistance of a parasitologist from another institution was necessary to complete on schedule the examination of stools from persons who were on vacation during the first collection. Since all the specimens had been concentrated, schedules of the processing team and the parasitologists did not need to be coordinated.

Since previous studies had indicated that the MIF concentration technique alone was highly efficient, and since three stools were obtained from each individual in the study, no other laboratory technique was employed routinely. However, to check the efficiency of the MIF concentration technique, direct wet mount preparations from a representative number of the MIF-preserved stools were examined; no additional protozoa were found.

Critical reports were obtained on all but six persons. Because rare suspicious *E. histolytica* forms were found in the stools, additional specimens in MIF preservative were requested from three of these individuals. In order to confirm species identification, additional specimens were also obtained in PVA fixative for hematoxylin permanent staining from the other three individuals found to harbor trophozoites of protozoa other than *E. histolytica*.

Altogether, 368 specimens were obtained from 120 of the 125 persons in the study; 5 persons did not submit stools. Twenty-seven persons harbored the following protozoa species: 6 *E. histolytica* (4 small race type), 14 *E. coli*, 15 *E. nana*, 1 *D. fragilis*, 1 *Iodamoeba bütschlii*, 3 *G. lamblia*, 1 *Chilomastix mesnili*, and 1 *Trichomonas hominis*. The incidence of *E. histolytica* was considered to fall within the normal range.

Only 2 of the 6 persons whose specimens were positive for *E. histolytica* were kitchen employees. They were removed from their duties and intensive therapy was begun. In view of satisfactory reports from the engineers concerning the general environmental factors and of the low rate of infection among the staff, the

school facilities were not considered to be the source of the infection. The college was advised that it would not be practical to examine the stools of all students. After a conference with the school authorities and the local health officer, the school physician planned to submit stool specimens of any student or member of the faculty who presented himself to the dispensary with symptoms suggestive of amebiasis. This program should insure early treatment of new cases and should alert the school and the health authorities when several cases occur simultaneously.

The investigation of this potential outbreak in a school indicates the need for a relatively simple procedure for collecting and examining stools for amebiasis to insure early attention to any outbreak and to encourage adequate surveillance. If the incidence of infection in this institution had been sufficient to cause concern, the rapid conclusion of the investigation would have permitted the initiation of remedial measures before the situation became alarming.

Discussion and Summary

Results of examining unpreserved stools collected in PVA fixative and in merthiolate, iodine, and formalin (MIF) stain preservative have indicated the value of the MIF preservative technique for collecting stools and of the MIF concentration method of examination for *Entamoeba histolytica* and other protozoa, as well as the high relative efficiency of the combined MIF concentration and hematoxylin stained PVA fixative fecal smear techniques for finding protozoa.

Experience with the identification of protozoa in saline and iodine wet mount preparations, in hematoxylin stained PVA fecal smears, and in MIF-preserved stools has shown that intestinal protozoa in MIF stain preservative usually are more easily identified than those encountered in wet mount preparations of unpreserved specimens, and in most instances are as readily identified as those found by examining hematoxylin stained PVA fixative stools. The iodine phase of staining disappears in MIF-preserved stools as the specimens age (3). This phase may be readily restored by making wet mount preparations with the MIF stain formula for direct wet mounts or with a plain iodine stain. How-

ever, as experience is gained with this technique there is usually less inclination to add additional stain except for an occasional differentiation of a specific structure.

The adaptation of the MIF stool collection method and MIF concentration examination techniques for use in the emergency investigation of a suspected outbreak of amebiasis demonstrates the flexibility and advantages of this procedure as a survey tool. In this and in other surveys, the procedure proved to be efficient in detecting and identifying protozoa, particularly *E. histolytica*. Many problems of collecting and transporting specimens to the laboratory were avoided, and cooperation in the use of this technique from field personnel and others was excellent. The method can be developed in a laboratory far in advance of its actual use and quickly put into operation when needed. Since each group of personnel can work independently of the others, difficulties arising from attempts to coordinate on short notice the activities of the field investigators, the persons to be examined, the laboratory processing crew, and the parasitologists are almost completely eliminated.

An additional advantage of the technique is that, before the specimen is submitted, each individual being examined preserves, fixes, and stains any parasites which he harbors. MIF-preserved specimens may be conveniently concentrated by the MIF concentration technique. The sediments, plus a small amount of MIF solution, can be stored in the refrigerator and held for several months without appreciable difference in the ease with which the parasites can be identified. Specimens may be concentrated in one laboratory and the sediments transported to another for examination by parasitologists.

Since parasites usually remain identifiable after long storage in MIF preservative, a laboratory can build up a collection of specimens for training personnel in the identification of MIF-preserved parasites. A few weeks of training is usually adequate, and the personnel are available as examiners when needed.

In this study, almost 100 percent relative efficiency in detecting protozoa was obtained with the combined MIF concentration and hematoxylin stained PVA fixative fecal smear techniques. This combination would appear to be excellent for detecting *E. histolytica*. How-

ever, the more complicated PVA fixative hematoxylin staining method may make the combination impractical. If so, the single MIF concentration technique, which requires only one collection preservative, with repeat specimens obtained either in MIF or in PVA fixative, would appear to be far superior to the usual method of collecting unpreserved stools, especially since the MIF concentration technique alone was almost as efficient as the combined techniques for *E. histolytica*, which is the primary concern in amebic investigations.

Helminth eggs are also easily detected and identified by the MIF concentration technique. Blagg and associates (4) have reported results indicating that this technique is more efficient in recovering helminth eggs than the concentration methods usually employed.

Results of these investigations and of additional applications of the MIF stool collection technique in a number of smaller surveys indicate that this method is the most effective and practical parasitological survey tool for amebic examinations with which the authors have had experience.

A portion of the data from the comparison of methods has been included in an earlier report on the advantages of the PVA fixative two-bottle stool collection technique (2).

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Cytoanalyzer

The cytoanalyzer, an automatic optical electronic machine which may greatly speed detection of cancer of the uterus, has been installed by the National Cancer Institute, Public Health Service, at the University of Tennessee in Memphis, for further testing. The machine is designed to detect abnormal cells by microscopically scanning slides of specimens from vaginal smears almost as fast as they are fed into it.

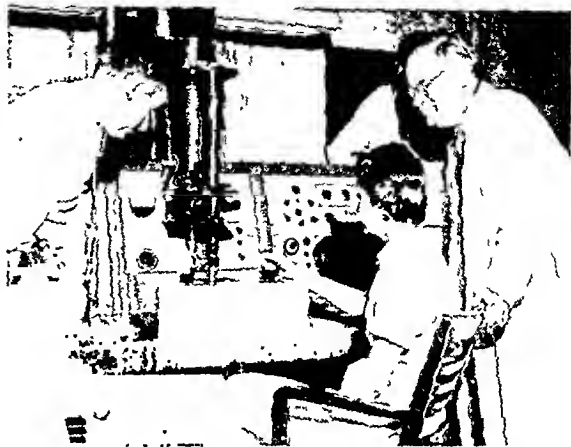
Cancer of the uterus is the second largest cause of cancer deaths among women. This fact and the current scarcity of technicians to analyze cell examination results underline the importance of perfecting the cytoanalyzer, which through speedier detection of the disease, may lead to more cures. The majority of women with uterine cancer can be cured if the disease is diagnosed in its early stages.

The cytoanalyzer being tested at Memphis was developed by the Airborne Instruments Laboratory, Inc., Mineola, N. Y., where Walter E. Tolles directed the research. Dr. George N. Papanicolaou, professor emeritus of clinical anatomy at Cornell University Medical College, has been consultant.

At the Memphis project, results given by the machine will be compared with those obtained by present methods in which technicians examine specimens under a microscope, and suspicious specimens are then referred to a pathologist. If the machine is perfected, the pathologist will examine only the slides selected by the electronic scanner.

The machine consists of a scanning microscope, computer and analyzer, and recorder. The scanner examines the pertinent area of the smear and converts the optical information into an electric beam which is passed to the computer and analyzer.

The computer measures the cells' nuclear size and nuclear optical density and distinguishes between signals arising from normal and suspicious cells. A nuclear measurement graph



At the University of Tennessee in Memphis, the cytoanalyzer undergoes testing for further development. Observing the machine's performance are, from left to right, Riley C. Bostrom, project engineer, Airborne Instruments Laboratory; Irma Rube, chief cytologist, Public Health Service; and Dr. Douglas H. Sprunt, professor of pathology and chairman of the division of pathology, Medical School of the University of Tennessee.

plots each accepted measurement so that cells can be rated as normal, suspicious, or deficient in information. The recorder makes a permanent record of the graph, notes the location of all abnormal measurements, and records the decision of the automatic smear classifier. Recordings of the nuclear measurement graph are made by a high intensity cathode ray tube and an oscillograph. All computations are made by the machine as the slide is scanned in less than one-fifth of a millisecond.

The Memphis project is concerned solely with uterine cancer. However, the National Cancer Institute is in the process of setting up four new centers to develop the application of the cytologic test to cancer of other body sites, the lung, large intestine, stomach, prostate, and urinary tract. Successful development of the cytoanalyzer will probably lead to its use in detecting cancer in these other sites.

Home ACCIDENT

Data

Statistical Resources

IN PLANNING a safety program, a health department depends on the statistician for the facts about the number and nature of home accidents: How many deaths are caused? How many injuries occur? What age groups are most affected? What situations or objects are associated? Information of this kind helps define immediate and long-term objectives.

Although current figures on nonfatal home accident injuries are scanty, data on injuries from home accidents are being collected in the National Health Survey. Estimates of home accident injuries for the United States will be available soon for quarterly periods commencing with July–September 1957. After a year's information has been collected, there will be data on home accident injuries by age and sex, for urban and rural areas, and for the four broad geographic regions of the country. After 2 years, figures will be classified for 11 geographic divisions, with separate data for 8 metropolitan areas of 2 million or more, other

standard metropolitan areas, all other urban areas, and rural areas. A farm and nonfarm breakdown will also be available.

From figures now available we know that falls are outstanding as causes of death. Minor injuries from nonfatal home accidents are primarily cuts or burns. Women have minor injuries more frequently than men. Home accidents are especially frequent among children and elderly persons. Poisonous chemicals common in households—kerosene, detergents, metal polish, bleaches—are responsible for many accidents to children under 5 years old.

To obtain incidence data for home accident injuries, the health department team may try an area survey, a study of hospital and clinic admissions, or an arrangement with physicians whereby cases treated are reported to the health department. A survey is expensive, while the other two methods give unrepresentative and incomplete coverage, especially for minor injuries. The choice can best be made by relating the program objectives to the kind and quality of information that may be collected and the cost of obtaining it.

The statistician can help measure progress of the program. Several years may elapse before the death and injury rates are affected. In the meantime, staff members are gaining experience; hazards are corrected; knowledge of hazards is improved; and public reaction may be judged by repeated requests for literature or speakers. More suggestions of this kind are given in a guide to the collection, analysis,

Based on an address by Evelyn Halpin, Ph.D., program analyst, National Office of Vital Statistics, Bureau of State Services, Public Health Service. Dr. Halpin's paper and the one by Dr. Cameron, which follows, were given at a joint meeting of the health education section and the statistical and clerical section of the Southern Branch of the American Public Health Association, Asheville, N. C., May 31, 1957.

and interpretation of service statistics in home accident prevention, developed by the Public Health Conference on Records and Statistics in 1956 (*Public Health Reports*, June 1957, pp. 494-498).

With the help of a records analyst, nurses and sanitarians may discover how to study or supplement their records so as to learn what portion of their time is spent on home accident prevention and what they have accomplished. They may also learn from him to apply sampling methods or periodic studies so that the burden of paperwork will be lightened.

Uniform definitions improve communication and measurement. For this reason, the American Public Health Association, the Public Health Service, and the National Safety Council sponsored a Conference on Definitions of Accidents in April 1957. While the tentative definitions prepared by the conference should be useful, they do not contain the classifications needed to analyze data nor do they specify the criteria that may be used in counting accidental injuries. The question of what to count in surveys or special studies must be answered by those who conduct a home safety program.

A basic innovation of the definitions is the presentation of the concept of an accident as a sequence or chain of events growing out of interactions of numerous factors, rather than a single event arising from one cause. This is in keeping with recognition of the multiplicity of agents and forces that influence the occurrence of accidents and the severity of the consequences. The concept of a sequence of events in accident situations, by identifying component factors, helps to indicate where preventive measures will be effective.

Professional guidance is useful in designing simple and effective records. Also, it is desirable to put new or revised record forms through a test before broad application. The public health nurse and the sanitary engineer can help to spot flaws in the forms and suggest modifications. Dummy table forms will outline the end product of any scheme for collecting data and will show whether the information is in the desired form. It is self-defeating to seek more information than can be reasonably and meaningfully tabulated and analyzed.

The statistician provides technical assistance to health officials in collecting and interpreting the figures they need to plan their work. With their help, he supplies information for appraising the importance of home accidents, defining objectives, and assessing accomplishments.

Local Sources

ONE of the first questions raised in the planning of a community safety program is whether it is satisfactory to plan on the basis of information derived from national experience, as recorded by the National Office of Vital Statistics and the National Safety Council, or whether plans should be prepared according to conditions peculiar to the local region, as established by local house-to-house surveys. Certain health departments have gone so far as to develop detailed classification systems to aid in the coding and analysis of accident information.

In the past the buckshot approach has been successful in public health practice because, with a variety of afflictions and causes in a community, almost any constructive measure—sanitation, housing, nutrition, education, or immunization—was bound to have some salutary effect. Today both economy and effectiveness are served by programs that apply specific controls aimed at specific defects. Realization of this need to replace the blunderbuss with the sharpshooter has introduced the term “community diagnosis.” Community diagnosis reaches conclusions based on a comprehensive history of past conditions coupled with specific examination techniques for obtaining a current appraisal of public health status. The scope of its application is limited, however, by the persistence of obsolescent and empirical practices.

Such diagnosis would determine whether or not farm and home safety programs warrant more attention than others. It might reveal, in certain communities, that the greater mor-

Based on a paper by Charles M. Cameron, Jr., M.D., M.P.H., associate professor, School of Public Health, University of North Carolina, Chapel Hill.

bidity and mortality results from a lack of maternity welfare services, or even of an adequate water source.

At the same time, the house-to-house survey is not essential to community diagnosis. Adequate information on the region may be available in existing records, through slight modifications of current records, or through specialized surveys.

Sources ordinarily neglected include tables of information from death certificates, records of clinics for crippled children, housing-inspection forms, or records of home visitors. Valuable though the information on death certificates may be, it is unlikely to be analyzed by town and county for age, race, and sex unless local authorities undertake the task themselves.

In North Carolina, a spot check of records of crippled children's clinics found that treatment of children injured in accidents required 10 percent of the clinic time. The nature of accidents most costly to the patient and community also can be determined from such records.

In housing records and reports of home visitors are found notations about faulty wiring, defective heating systems, dangerous stairways, and other hazards that may be of more consequence than a deficiency of toilets, careless garbage disposal, or the presence of rats and other vermin.

Other sources of information include records of hospital admissions and emergency services, fire inspections, coroners, absences from school

or work, health insurance payments, and police calls. Agricultural extension workers and safety councils also prepare reports offering valuable information on home and farm accidents.

From such records it was learned that in one locality accidents were the third most frequent cause of hospitalization; that off-the-job accidents cost more time from work in one industrial center than on-the-job injuries; that of 2,453 persons seeking emergency treatment in a California community, only 197 were injured by a car, 324 in industrial employment, and 1,932 at home or in public places.

When existing records are uninformative, slight modifications can produce the facts needed, as one Blue Cross organization learned. Many industrial health agencies have only recently begun to record off-the-job accidents.

Often special surveys may be obtained from physicians who have kept records to gain an insight into accident incidence and prevalence. More extensive surveys may reveal, as in the California morbidity survey of 1954-55, that accidents are second in frequency only to the "common cold" as a cause of acute illness. Respiratory infections caused about half of the illnesses, and accidents caused one-fourth.

With such opportunities, it appears that the health department can plan its safety program more intelligently if it taps the sources of information locally available.

Traineeships for Graduate Nurses

Grants totaling \$3 million have been made to 60 schools of nursing and public health throughout the country in the second year of a Public Health Service program to meet the shortage of nurses qualified for teaching and administrative positions. These institutions will award traineeships to qualified nurses interested in teaching in nursing schools, or in administration and supervision in hospital nursing services, nursing schools, and public health agencies.

About 800 graduate nurses will benefit from the grants. In fiscal year 1957, a total of 587 traineeships were made available to 56 institutions under a \$2 million appropriation.

publications

Bibliography of Writings by Great Names in Neurology

PHS Publication No. 554 (Public Health Bibliography Series No. 17). 1957. 80 pages.

Complete bibliographies of four great names in neurology—Joseph Babinski, Sir Victor Horsley, Sir Charles Sherrington, and Arthur Van Gehuchten—are assembled in this brochure. Each bibliography is preceded by a brief biographical sketch.

The brochure was prepared for the First International Congress of Neurological Sciences, Brussels, Belgium, July 21-26, 1957, by the National Institute of Neurological Diseases and Blindness, National Institutes of Health, Public Health Service.

Social Work in Hospitals

PHS Publication No. 519. 1957. 117 pages; tables and charts. 65 cents.

Basic factual information for 1954-55 on social service departments in an estimated 967 general and tuberculosis hospitals in the United States and their nearly 3,700 social work staff is set forth in this publication for hospital administrators and social workers. The survey, the first comprehensive one in this field since 1930, was a joint project of the American Hospital Association, the Medical Social Work Section of the National Association of Social Workers, and the Public Health Service.

Defining a social service department as one or more persons employed full or part time to perform duties that the hospital considers to be social service activities, the report covers these aspects of the subject: educational qualifications of social work staff, administration and facilities of social service departments, and major social service roles

of hospitals. It also gives the number of patients receiving social services and describes the various social service activities provided for patients.

A summary section presents major findings, conclusions, and recommendations concerning supply and utilization of social workers in hospitals.

National Venereal Disease Control Program

PHS Publication No. 56. Revised 1957. 14 pages; illustrated. 15 cents.

Originally published in 1951, this revision brings up to date a summary examination of venereal disease control problems in the United States, and of Federal, State, and local attempts to meet them.

Factors which contribute to the spread of the disease and hamper control measures are discussed. A historical background of the nationwide control program, including laboratory and epidemiological aspects, is presented.

Attention is given to organization and function of field personnel, with a description of their complex operation of case finding, treatment, and education. The place and importance of statistical control are explained.

Directory of State and Territorial Health Authorities, 1957

PHS Publication No. 75. Revised 1957. 96 pages. 35 cents.

This directory lists, as of April 1957, the title of each State health department and the name of the officer in charge, and organizational units of individual States with the names of officials directing the units. Also included are officials of State agencies other than health agencies

directing grant-in-aid programs, and State agencies officially designated for the administration of the Water Pollution Control Act and crippled children's services.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

Immunization Information for International Travel

Summary of changes June 1956-March 1957

Supplement to PHS Publication No. 384. 1957. 28 pages. 15 cents.

This supplement brings up to date the immunization requirements for entering the different countries. The principal changes are the specifying of the age at which infants are expected to be vaccinated against certain diseases at the time of entrance into a country, and the elimination of endemic zones in relation to the yellow fever vaccination requirement. Also listed are additional yellow fever vaccination centers.

**WHAT YOU SHOULD KNOW
ABOUT ASIAN FLU.** *PHS Publication No. 561. 1957. 4-fold leaflet. 5 cents; \$3.00 per 100.* Prevention, symptoms, and treatment of Asian influenza are described briefly. Complications which demand medical attention are delineated.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.



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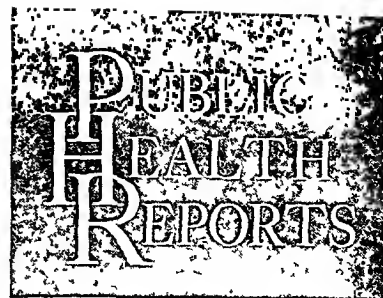
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and professional staff of outpatient psychiatric clinics.

Anita K. Bahn and Vivian B. Norman

87 pages. A summary and information on availability appear on
pages 1127-1129.

PUBLIC HEALTH MONOGRAPH No. 50 . . . United States-
U.S.S.R. medical exchange missions, 1956.

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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The effort to define and standardize terms and categories used in morbidity statistics has produced intense discussion and a few distinct differences among biometricians. Dr. Dorn's contribution to this discussion indicates some of the issues that lie in the way of general agreement.

A Classification System for Morbidity Concepts

HAROLD F. DORN, Ph.D.

THE LOW DEATH RATE in most of the countries of Europe, North America, and Oceania, and in certain countries in other parts of the world greatly limits the usefulness of mortality statistics as a measure of the amount and characteristics of ill health of the population of these countries. The recognition of this fact has stimulated interest in the collection and analysis of a variety of morbidity statistics.

Although morbidity statistics for insured populations and for members of sick benefit associations date from the last century, corresponding statistics for the general population are of much more recent origin. General morbidity surveys of selected areas of a country or of special population groups were made as long as 40 years ago, but efforts to collect general morbidity data for the entire population of a country date from about 1940.

The publication of the findings of general morbidity surveys has made clear that there is no consensus concerning terms used to describe and measure morbidity. This is not surprising since agreement on terminology is not easy

to achieve. It is a sound principle that attempts to reach agreement on the definition of standard terms should be preceded by a period of use of a variety of terms so that the adoption of a standard terminology may be based upon the demonstrated utility of the preferred terms.

The statistical description and measurement of morbidity is more complex than that of mortality. In addition, experience in the use of different terms is still rather limited so that it is doubtful if the time is ripe for an attempt to reach agreement upon a list of standard morbidity terms for use on a national basis. Nevertheless, it would be advantageous to encourage discussion of the types of terms required in the description and measurement of morbidity and also to propose the use of some terms on a trial basis in order to bring about the consensus requisite to agreement upon a standard terminology.

A large number of terms to describe the different aspects of ill health and to measure the risk of becoming ill, the amount of ill health in a population, or the amount of disability due to ill health already exist. If these existing terms are to be organized into an orderly system, it is essential first to develop a general scheme for classifying and enumerating the

Dr. Dorn is chief of the Biometrics Branch, Division of Research Services, National Institutes of Health, Public Health Service, Bethesda, Md.

unit or units of observation in morbidity studies. This paper proposes such a general scheme.

It is necessary to use certain terms in order to continue with this discussion. These should not be regarded as necessarily being preferred terms; they are used only for the purpose of facilitating this discussion. Once a general scheme is outlined, the definition of the various concepts involved can be considered.

A period of ill health is a continuous interval of time during which a person experiences a departure from a state of good health. This also has been called a spell or episode of ill health or a complaint period.

During a period of ill health, one or more separate diagnostic entities or causes of ill health may exist. These will be called illnesses or diagnoses with the understanding that illness includes conditions resulting from disease, poisoning, and injury.

The amount of ill health in a population may be measured by (a) the number of persons who are ill, (b) the number of periods of ill health, or (c) the number of separate illnesses or diagnoses. During a fixed interval of time one person may experience one or more periods of ill health with one or more illnesses during each period. Consequently, it is important to be clear as to which unit of measurement is being used since the definition and method of computation of morbidity rates is not the same for each unit.

For the purpose of measuring morbidity, ill health may be classified (a) with respect to the interval of time during which observations are made, and (b) from the point of view of the person affected.

If we observe a population during a specified interval of time, four categories of ill health may be observed. For convenience in exposition the term "case" will be used to denote the manifestation of ill health being observed and may refer to a person, a period of ill health, or an illness.

1. Cases existing prior to the start of the interval, continuing throughout the interval, and still existing at the end of the interval.

2. Cases existing prior to the start of the interval and terminating during the interval.

3. Cases beginning during the interval and still existing at the end of the interval.

4. Cases beginning during the interval and terminating during the interval.

Since the term "case" is here used in a general sense, category 1, for example, may be interpreted as (a) the number of persons becoming ill and recovering during the interval, t_1 to t_2 , or (b) the number of periods of ill health beginning and terminating during the interval, t_1 to t_2 , or (c) the number of separate illnesses beginning and terminating during the interval, t_1 to t_2 . In general, these three numbers will not be the same.

This classification suggests three ways of counting cases in relation to time.

1. The number of cases existing at some point of time, for example at t_1 . This would include categories 1 and 2 shown in diagram 1. In practice, this may be defined as the number of cases existing during a single day or as the average daily number of cases existing during the interval t_1 to t_2 .

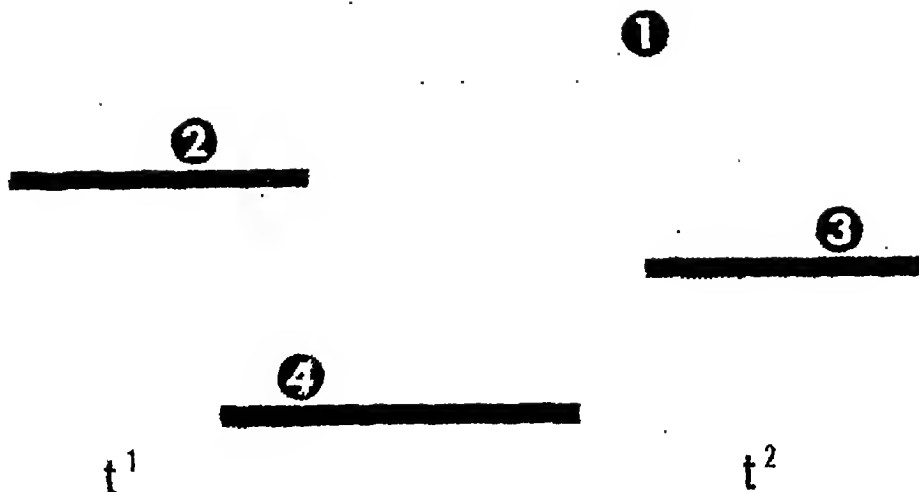
2. The number of cases existing at any time during the interval, t_1 to t_2 . This is an index of the total amount of illness during the interval and would include a count of all four categories of cases shown in diagram 1.

3. The number of cases with onset during a specified interval of time, for example, between t_1 and t_2 . This would include categories 3 and 4 shown in the diagram.

The relationship between the three units in which cases of ill health may be enumerated can be seen from the following classification of ill health from the point of view of the person affected (diagram 2).

During a specified interval of time a person may experience (a) no period of ill health, or (b) a single period of ill health, or (c) two or more periods of ill health. During each period of ill health one or more distinct illnesses or diagnoses may exist. Each illness may be (a) the first attack during the person's lifetime, or (b) the first attack during the period of ill health, or (c) the second or subsequent attack during the period. For the second and subsequent periods of ill health during the interval of observation, a specific illness may be classified as to whether or not it is the first attack during this interval.

Diagram 1.



First attacks may be illnesses (*a*) for which one attack gives lifelong immunity, for example, smallpox or measles; or (*b*) from which complete recovery may occur but no immunity from subsequent attacks exists, for example, the common cold or pneumonia; or (*c*) with a persistent residual pathological process characterized by alternating periods of remission of symptoms and clinical manifestation of ill health. Most chronic diseases such as bronchitis, asthma, and arthritis fall into this last category. Included also are illnesses for which even temporary remission of symptoms does not occur. This classification of first attacks applies equally to all subsequent attacks of illness except for the class of illnesses that give lifelong immunity after one attack.

Three ways of counting cases of ill health with respect to time were mentioned above: (*a*) the number of cases existing at some point in time, (*b*) the number of cases existing at any time during an interval of time, and (*c*) the

number of cases with onset during some interval of time. The first two ways result in measures of the amount of ill health in a population and the third way results in a measure of the risk of ill health or of the rate at which ill health develops in a population.

Rates computed from the first two ways of counting cases may be termed prevalence rates of ill health. They measure (*a*) the amount of ill health at a particular point of time, in practice usually a given day, that is, point prevalence; or (*b*) the amount of ill health during a specified interval of time, a month or a year—period prevalence.

Prevalence rates may be based upon a count of persons who are ill, a count of periods of ill health, or a count of illnesses. For a prevalence rate at a particular point of time, the number of ill persons and the number of periods of ill health is the same. However, the number of illnesses or diagnoses may be greater than the number of ill persons.

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For the purpose of measuring morbidity, ill health may be classified (a) with respect to the interval of time during which observations are made, and (b) from the point of view of the person affected.

If we observe a population during a specified interval of time, four categories of ill health may be observed. For convenience in exposition the term "case" will be used to denote the manifestation of ill health being observed and may refer to a person, a period of ill health, or an illness.

1. Cases existing prior to the start of the interval, continuing throughout the interval, and still existing at the end of the interval.

2. Cases existing prior to the start of the interval and terminating during the interval.

3. Cases beginning during the interval and still existing at the end of the interval.

4. Cases beginning during the interval and terminating during the interval.

Since the term "case" is here used in a general sense, category 4, for example, may be interpreted as (a) the number of persons becoming ill and recovering during the interval, t_1 to t_2 , or (b) the number of periods of ill health beginning and terminating during the interval, t_1 to t_2 , or (c) the number of separate illnesses beginning and terminating during the interval, t_1 to t_2 . In general, these three numbers will not be the same.

This classification suggests three ways of counting cases in relation to time.

1. The number of cases existing at some point of time, for example at t_1 . This would include categories 1 and 2 shown in diagram 1. In practice, this may be defined as the number of cases existing during a single day or as the average daily number of cases existing during the interval t_1 to t_2 .

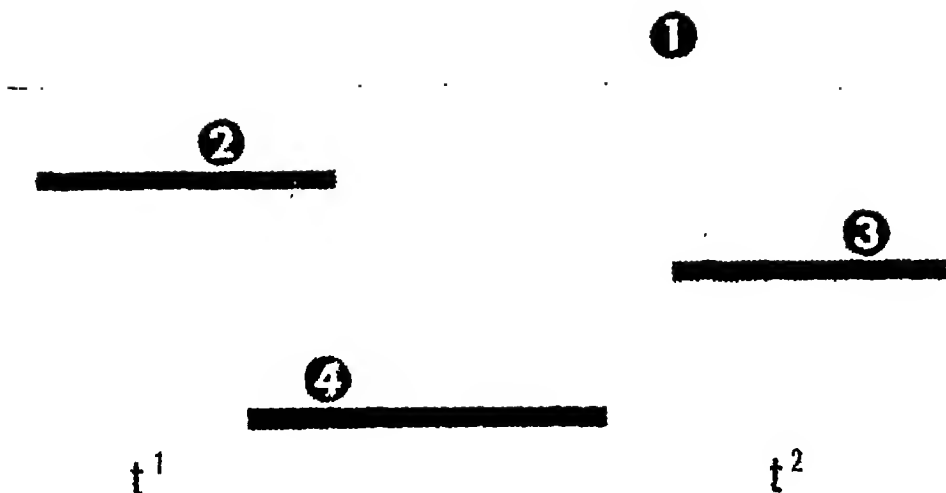
2. The number of cases existing at any time during the interval, t_1 to t_2 . This is an index of the total amount of illness during the interval and would include a count of all four categories of cases shown in diagram 1.

3. The number of cases with onset during a specified interval of time, for example, between t_1 and t_2 . This would include categories 3 and 4 shown in the diagram.

The relationship between the three units in which cases of ill health may be enumerated can be seen from the following classification of ill health from the point of view of the person affected (diagram 2).

During a specified interval of time a person may experience (a) no period of ill health, or (b) a single period of ill health, or (c) two or more periods of ill health. During each period of ill health one or more distinct illnesses or diagnoses may exist. Each illness may be (a) the first attack during the person's lifetime, or (b) the first attack during the period of ill health, or (c) the second or subsequent attack during the period. For the second and subsequent periods of ill health during the interval of observation, a specific illness may be classified as to whether or not it is the first attack during this interval.

Diagram 1.



First attacks may be illnesses (*a*) for which one attack gives lifelong immunity, for example, smallpox or measles; or (*b*) from which complete recovery may occur but no immunity from subsequent attacks exists, for example, the common cold or pneumonia; or (*c*) with a persistent residual pathological process characterized by alternating periods of remission of symptoms and clinical manifestation of ill health. Most chronic diseases such as bronchitis, asthma, and arthritis fall into this last category. Included also are illnesses for which even temporary remission of symptoms does not occur. This classification of first attacks applies equally to all subsequent attacks of illness except for the class of illnesses that give lifelong immunity after one attack.

Three ways of counting cases of ill health with respect to time were mentioned above: (*a*) the number of cases existing at some point in time, (*b*) the number of cases existing at any time during an interval of time, and (*c*) the

number of cases with onset during some interval of time. The first two ways result in measures of the amount of ill health in a population and the third way results in a measure of the risk of ill health or of the rate at which ill health develops in a population.

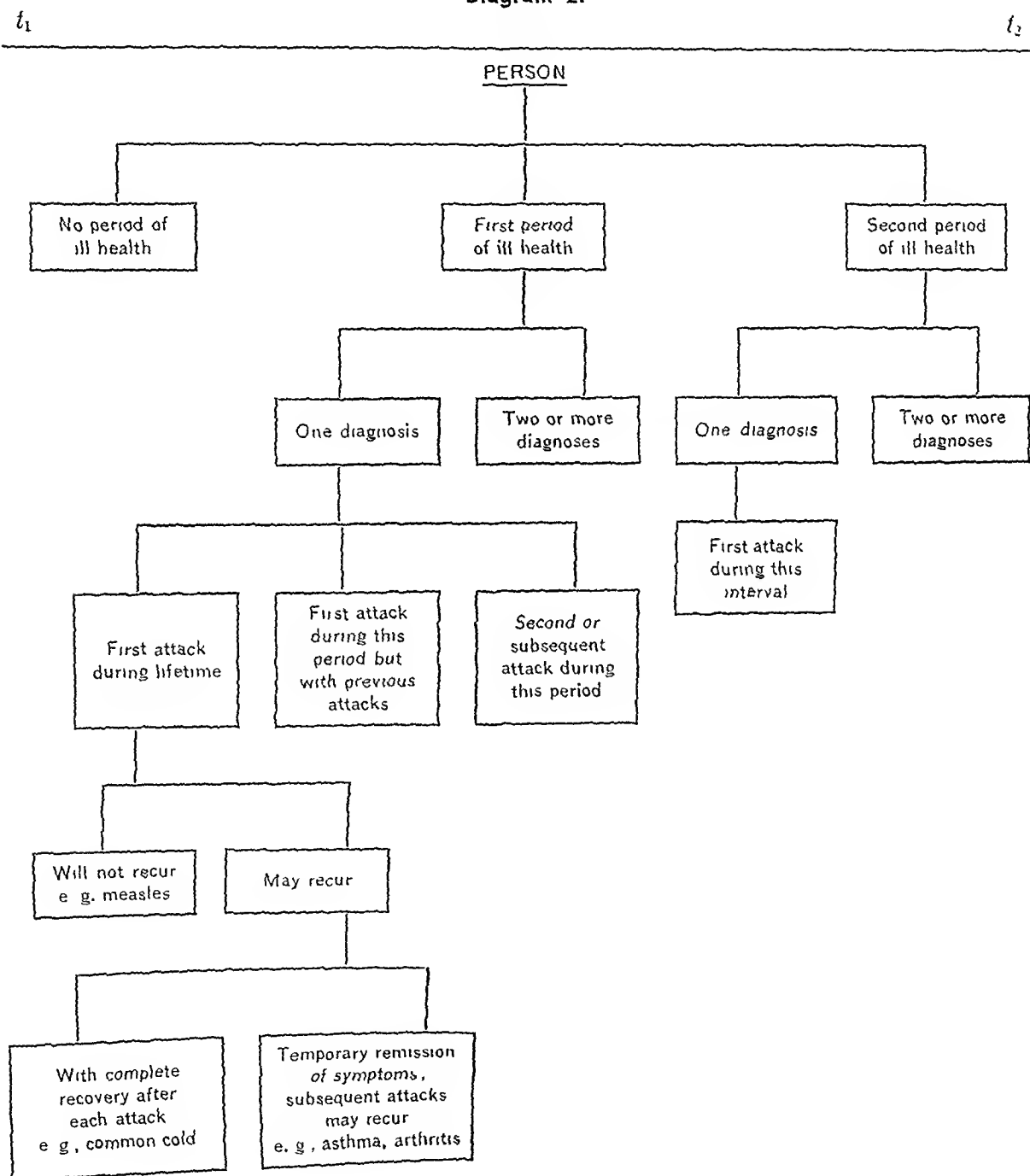
Rates computed from the first two ways of counting cases may be termed prevalence rates of ill health. They measure (*a*) the amount of ill health at a particular point of time, in practice usually a given day, that is, point prevalence; or (*b*) the amount of ill health during a specified interval of time, a month or a year—period prevalence.

Prevalence rates may be based upon a count of persons who are ill, a count of periods of ill health, or a count of illnesses. For a prevalence rate at a particular point of time, the number of ill persons and the number of periods of ill health is the same. However, the number of illnesses or diagnoses may be greater than the number of ill persons.

A prevalence rate for an interval of time, t_1 to t_2 , is based on a count of cases existing at t_1 plus all cases beginning during the interval, t_1 to t_2 . In this instance the prevalence rate for persons usually will be less than that for periods of ill health which in turn will be less than that for illnesses or diagnoses. A useful

special form of a prevalence rate during an interval, t_1 to t_2 , is the proportion of a population which is ill, computed as a daily average for the interval. In this form, it is often called the daily noneffective rate and shows the proportion of a population which is ill on an average day.

Diagram 2.



A rate computed from the third way of counting cases with respect to time, that is from a count of cases beginning during an interval, may be termed an incidence rate. This is a measure of the risk of becoming ill or of the rate at which ill health develops. It may be computed for persons, periods of ill health, or for illnesses. The method of computation and interpretation is, of course, different in each instance.

An incidence rate for persons represents the proportion of the population that is ill at least once during the interval t_1 to t_2 . An incidence rate for periods of ill health represents, per unit of population, the number of separate periods of ill health developing during the interval, t_1 to t_2 . The magnitude of this rate may exceed that of the unit of population on which the rate is based. For example, a rate per head may be greater than unity.

Before an incidence rate for illnesses can be computed, it is necessary to decide which of the types of illnesses shown in diagram 2 are to be used. Illnesses that give lifelong immunity after one attack present no special problem. Illnesses from which complete recovery is possible may be counted the first time they occur in each period of ill health. A person with two or more periods of ill health may have two or more common colds during an interval of observation. A second attack of the same illness during a single period of ill health creates a more difficult problem, for it is necessary to decide whether the second attack is merely a prolongation of the first or is a new attack of the same disease and hence should be counted in the computation of an incidence rate.

The greatest problem is created by some of the so-called chronic illnesses that are characterized by alternating periods of active clinical manifestation of ill health and lack of symptoms. Asthma, bronchitis, arthritis, and migraine are examples of this class of illnesses. A count of attacks of these illnesses can be based upon (a) the first attack during a lifetime, or (b) the first attack during the interval, t_1 to t_2 , or (c) the first attack during a period of ill health, or (d) each separate attack during a period of ill health. Obviously the magnitude and interpretation of the incidence

rates based on these methods of counting cases will differ greatly.

Incidence and prevalence rates belong to a class of rates designed to measure the frequency of ill health. Although certain incidence and prevalence rates, namely, those based on persons sick one or more times, taken as a unit or on first attacks of illness, may be interpreted as relative frequencies with a maximum value of unity and hence may be considered to be a measure of the probability of ill health, the remaining rates are in reality weighted averages and may exceed unity when expressed per head of population.

A second class of rates are those designed to measure disability. These yield the average number of days of disability (a) per person, (b) per period of ill health, or (c) per illness. The usual method of computation is to divide the number of days of disability during a specified interval, t_1 to t_2 , by the appropriate denominator and express the quotient on a per annum basis. If the rate is for persons, the appropriate denominator would be the average number of persons in the population during the interval. There are advantages in counting only days of disability occurring within the interval, t_1 to t_2 , for persons who are ill at the beginning of the interval. This rate yields the average number of days of disability per person per annum or some other unit of time.

If the rate based on persons is expressed per day, it is often called the daily noneffective rate since it is the average proportion of persons who are disabled on a given day during the interval, t_1 to t_2 . This results from the fact that a day of disability is equivalent to one person disabled for 1 day. The daily disability or noneffective rate also is an average daily prevalence rate.

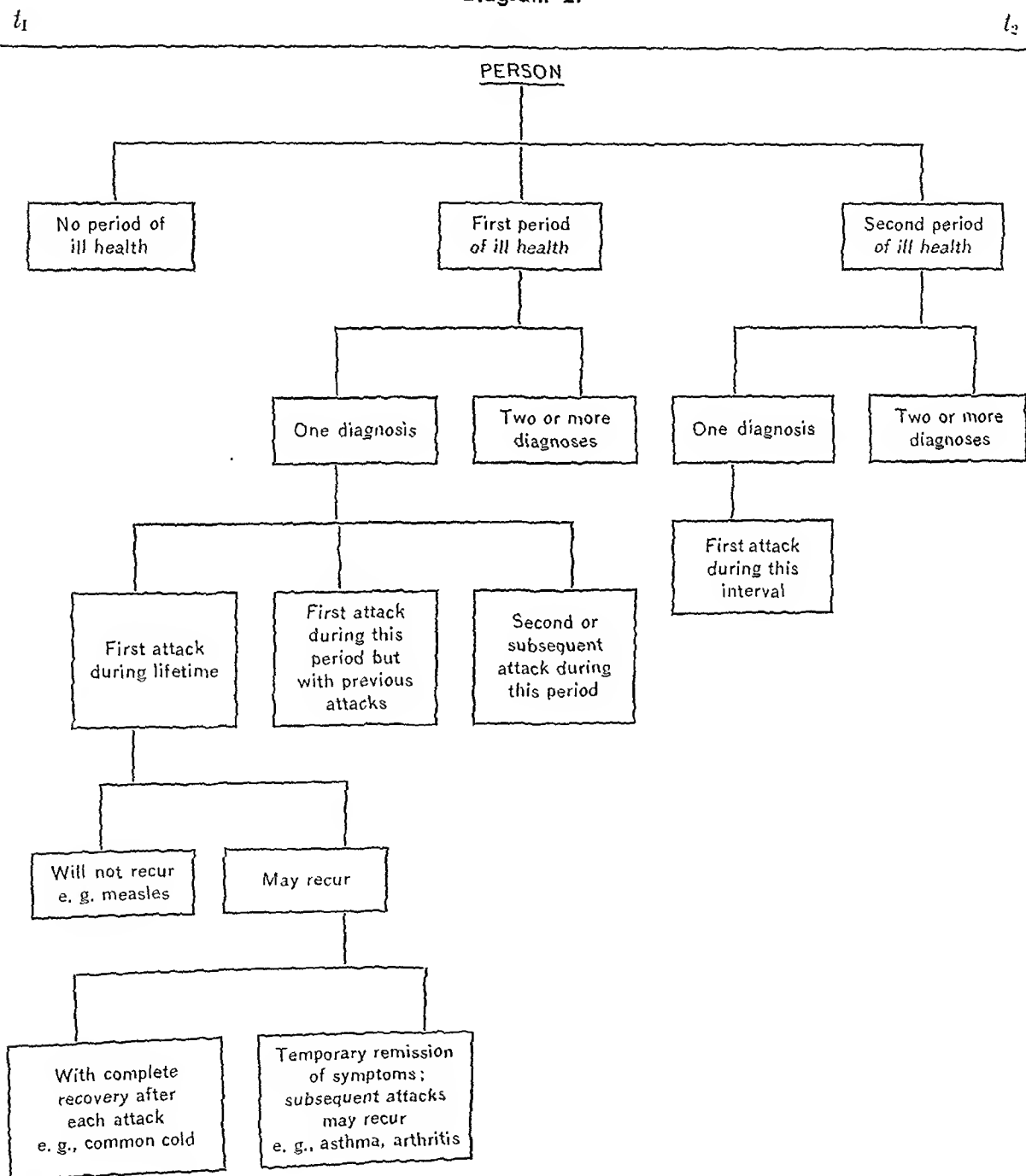
The computation of the average number of days of disability per illness creates knotty problems in the determination of the number of days of disability to assign to two or more illnesses occurring during the same period of ill health.

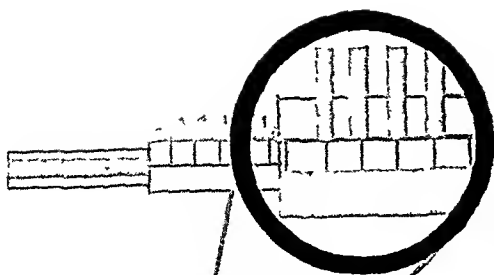
The amount of disability due to a period of ill health may be computed by dividing the total number of days of disability during the interval, t_1 to t_2 , by the number of periods of

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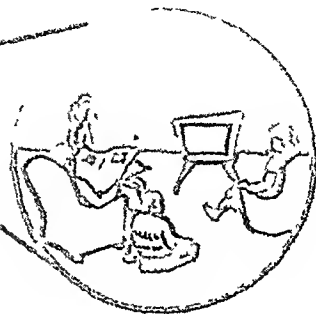
special form of a prevalence rate during an interval, t_1 to t_2 , is the proportion of a population which is ill, computed as a daily average for the interval. In this form, it is often called the daily noneffective rate and shows the proportion of a population which is ill on an average day.

Diagram 2.





Occupational Health



Health, Production, and Morale

Few enterprises in the economy of public health are as dynamic and protean as those broadly categorized as occupational health. The intense concern with this work is reflected in the numbers who turn out for the occupational health sessions at most public health conferences.

Far beyond a nearsighted concentration on specific toxins, particle concentrations, decibels, or safety boots, occupational health has extended its vision to place specialized hazards within the frame of total health needs. The most effective occupational health work is found to concern itself with the general health of each employee. Efforts directed in the past at reducing losses and claims related to accidents and occupational injuries are being directed more at maintaining productivity and morale in the working force.

The changed concept of occupational health is evident in the 1955 decision of the American Medi-

cal Association that physicians qualifying should be certified by the Board of Preventive Medicine as diplomates in occupational medicine, a subspecialty of preventive medicine.

The dominance of preventive over surgical aspects of this work is another indication of the evolutionary trend. It is brought about by a combination of advances in the skill of medical service, by the experience and wisdom of management, and by the tendency of labor to seek services rather than wage gains which are dissipated by leaps in living costs.

The present issue of *Public Health Reports* carries an extra large portion of papers on occupational health for the purpose of directing attention to some of the possibilities in this important, growing, and swiftly changing aspect of the public health profession.

—HAROLD J. MAGNUSON, M.D., chief, Occupational Health Program, Public Health Service.

ill health during the interval. For periods that begin before the interval of observation, only the days of disability during the interval are counted. Similarly for periods not terminated at the end of the interval, only the days of disability during the interval are counted.

This definition leads to an interesting relationship between frequency and disability rates when the frequency rate is defined as the number of periods of ill health existing during the interval divided by the average number of persons in the population with the quotient expressed per head. Then, if F represents the frequency rate, D the disability rate per person, and S the disability rate per period, $F \times S = D$; or $F = D/S$.

Another special relationship exists if the frequency rate is defined as in the previous paragraph and expressed per person per day, that is, as a daily rate per person, and the disability rate is computed for persons and expressed as an average daily prevalence rate or noneffective rate per person. Then from the relationship between F , S , and D shown above, we have $F = D/S$, or

$$\text{daily morbidity rate} = \frac{\text{daily noneffective rate}}{\text{average number of days of disability per period of ill health}}$$

If the daily morbidity rate is 1 per 1,000, the daily noneffective rate, that is, the proportion of the population ill on an average day, equals the average number of days of disability per period of ill health. For example, if the daily hospital admission rate is 1 per 1,000, the proportion of the population in hospitals on an average day is equal to the average duration of stay in hospitals.

In general the above relationships between frequency and disability rates hold true only in a population with a fixed pattern of ill

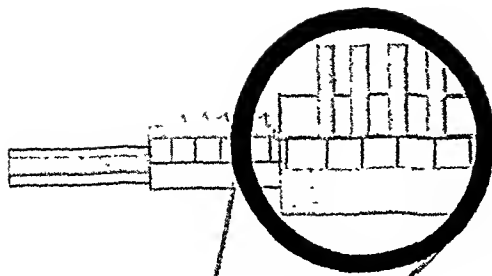
health. A further discussion of this point is beyond the scope of this paper.

Some persons have computed the measure of disability as the average duration of periods of ill health ending during the interval of observation, t_1 to t_2 . This necessitates counting the days of disability occurring before time, t_1 , for periods of ill health existing at t_1 . There is no reason why this method of computation should not be used provided the result is useful. However, if this is done, the above relationships between F , D , and S no longer hold true. Furthermore, although this method of computation gives the correct duration of cases terminating during the interval, t_1 to t_2 , this is not necessarily the same as the eventual duration of cases still ill at the end of the interval except for a population with a fixed pattern of ill health.

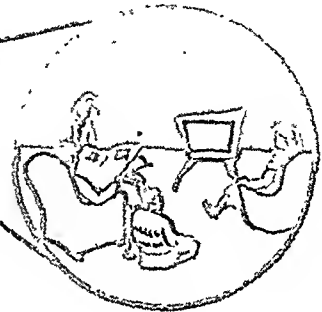
The above discussion is only an introduction to concepts useful in general morbidity statistics of a population. Terms useful for special morbidity statistics, such as hospital statistics and insurance statistics, have not been considered. The purpose of this discussion is to clarify some of the basic concepts useful in the description and measurement of morbidity in order to provide a basis for the development of widely acceptable definitions for specific terms.

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—HAROLD J. MAGNUSON, M.D., chief, *Occupational Health Program, Public Health Service.*

Small Plant Health Services and the Health Officer

JOSEPH H. GERBER, M.D., Dr.P.H.

THE PROGRESS made in occupational health in the past 50 years has been tremendous. Services that started out to provide traumatic surgery alone now encompass such elements as preplacement, periodic and return-from-illness examinations, treatment of occupational illnesses and injuries, emergency treatment of nonoccupational conditions followed by referral to family physicians for definitive care, health counseling and education, the prevention and control of job-related environmental health and safety hazards, and proper recordkeeping with the provision for confidentiality of personal health files. Through the application of the principles of preventive medicine and public health, we are now in a position to prevent illness, disease, and disability and to maintain optimal health of employed persons.

In addition to the emphasis now being placed on prevention, a most significant development in this field is management's growing recognition of its obligations to provide a safe working environment and its opportunity to promote better health for workers. This attitude is more than the response to a humanitarian impulse. Experience has shown that occupational health programs, properly organized and conducted, lead to reduced absenteeism from sickness, improved employee morale, increased productivity, decreased personnel turnover, and lowered compensation-insurance rates.

And yet, despite this notable progress, the fact is that occupational health services are at

present available to comparatively few workers. Particularly lacking are services to employees of small plants—those with fewer than 500 employees. Seventy percent of all workers are employed in plants of this size. Less than 5 percent of these employees have available to them any type of implant, on-the-job medical services. This situation is and should be of concern to all public health workers.

To what can we ascribe the relatively slow acceptance, especially by small plants, of programs so mutually beneficial? Three main reasons can be cited:

- Lack of appreciation (and perhaps knowledge) by management of the many benefits and advantages to employer as well as employee.
- Belief on the part of management that costs of such programs are excessive.
- Difficulty in obtaining advice and assistance in developing such services.

What can the health officer do to rectify this situation? By adding to his own knowledge of local factors an acquaintance with the efforts being made elsewhere to provide health services for small plant workers, the health officer can choose the approach—or approaches—that might best succeed in his community and then attempt to stimulate appropriate action.

Practical Programs

Experience offers a variety of practical methods for providing health services to employees of small establishments. Here are five of such programs which have seen successful operation.

Dr. Gerber is chief of the Health Conservation Section, Occupational Health Program, Division of Special Health Services, Public Health Service.

Part-time implant medical services have been sponsored cooperatively by managements of several companies in a community. Typical programs are the Hartford (Conn.) Small Plant Group Medical Service and the New Haven (Conn.) Small Plant Medical Program, which have been operating 11 and 3 years respectively. Organization of the Hartford group was spurred on and the program continues to be supported by an official of one of the member companies. In New Haven the chamber of commerce took the initiative. In both communities, the bureau of industrial hygiene of the Connecticut State Department of Health has lent its active support and guidance.

In both programs one full-time physician is employed by the member companies, each of which maintains its own dispensary and full-time or part-time nurses. The physician visits each plant at a scheduled time and is available for emergencies at all times. Each member company designates one employee as "coordinator" with responsibility for the program's administration in his company. At least once a year the coordinators from all member companies meet to transact joint business.

Experience in these two communities indicates that this type of program works well when some one person in the community is actively interested in the program, the chosen physician is "dedicated," and there are health facilities and personnel in each plant readily available to the employees.

Union health centers provide varying health services for their own members. An increasing number of such centers are now providing services to members of other unions in the community or are being organized jointly by two or more unions. The services include definitive medical care and, increasingly, preventive services. Many centers also serve families of members.

Individual physicians or groups of physicians themselves have provided part-time, implant medical services. Some physicians are limiting their practices to industrial medicine and serving a number of plants. In such cases they usually visit the plants and are concerned with on-the-job environmental conditions as well as with provision of emergency care and

physical examinations. In many instances, however, the physician is "on call" for emergency care only. Plants with this type of program may or may not employ nursing personnel or contract with a visiting nurse association for implant service.

It is estimated that more than 25,000 physicians are doing industrial medical work—5,000 full time, 10,000 part time, and another 10,000 on call. But only 164 of these have been certified in occupational medicine by the American Board of Preventive Medicine, and only 3,400 are members of the Industrial Medical Association.

Mobile clinics have been established in a number of communities under various auspices. Nonprofit organizations have been established to operate such clinics in at least two communities (Birmingham, Ala., and Atlanta, Ga.) with the support and guidance of health department personnel. In Asherille, N. C., the privately owned and operated Occupational Health Service has several mobile units which provide comprehensive physical examinations at the plant site, with the necessary adjunctive laboratory and X-ray studies. A number of the locals of the International Ladies Garment Workers Union are using mobile units to provide examinations for their members near or at their place of work.

Insurance companies have assisted many establishments in developing occupational health programs. The varying types of such assistance have included the provision of implant nursing services.

Role of the Health Department

Health department interest in the promotion of occupational health services has been largely confined to the activities of approximately 40 States and 20 local health departments which have special units for this purpose. A recent count, including the three State labor department programs in Illinois, Massachusetts, and New York, reveals that a total of 355 employees are engaged specifically in occupational health activities. It is significant, however, that 289 of these are engineers, chemists, physicists, or other nonmedical workers, while only 31 are nurses and 26 are physicians. It may be concluded, therefore, that in some of the State and

local occupational health programs there is underemphasis of preventive medical aspects.

It has been said many times before and should be repeated and repeated again—health on the job is and must be related to health away from the job. This seems obvious enough, but it is amazing how often this interrelation is disregarded. It is important for those planning occupational health programs to do so with an understanding of community health activities and an appreciation that integration of the two is the essential program ingredient. The current emphasis on prevention and early diagnosis of long-term illnesses makes more apparent than ever the need for concurrence in approach and operation of all health programs.

It appears obvious that the health department, of all community health agencies, is best equipped to provide this holistic approach. Is it not timely for health officers to take a fresh look at their occupational health activities, particularly from the viewpoint of relating them to their other program activities? It is possible that a health department's consideration of these questions may reveal activities that need strengthening, areas that need exploration:

- What information have we about the size, number, and kinds of industrial and business establishments in this community?

- How many of them have occupational health programs? Which elements of a comprehensive program are being neglected?

- What services does this health department now provide to industrial and business establishments? Are our nurses, sanitarians, nutrition consultants, and health educators visiting them?

- Are the accident programs in plants adequate? Are toxic agents well controlled? Are health department services in these areas being utilized? What additional services are required? Should we provide them? What services and information are available through other official sources—State labor departments and workmen's compensation agencies, for instance?

- What services are voluntary agencies providing to industrial establishments?

- Is the health department providing chest X-ray and serology services to plant health programs?

- Have we conducted any surveys—diabetes, glaucoma, tuberculosis, syphilis—among employees?

- What more can the health department together with the medical society, the chamber of commerce, the trade associations, unions, and other voluntary agencies do to assist establishments in organizing effective occupational health programs?

- Are we setting a good example by providing the services of a good occupational health program for State and local government employees?

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Workers' Compensation and the Physician

THEODORE C. WATERS, LL.B.

WORKMEN'S compensation laws have been enacted in all States and Territories of the United States. With the passage of the Longshoremen's and Harbor Workers' Compensation Act in 1927 and the Federal Employees' Compensation Act in 1908, they have been extended to all Federal jurisdictions and positions, including the District of Columbia.

Prior to the enactment of such legislation, an employee had a common law right of action against his employer for injuries arising out of and in the course of employment, dependent upon proof of his employer's negligence. Therefore, the common law recognized and enforced the liability of an employer for injuries to his employees caused by the employer's negligence. That rule, however, became qualified by the legal recognition of common law defenses of the employer, which were the employee's assumption of risk, the employee's contributory negligence, and the negligence of the employee's fellow workers.

The enactment of workmen's compensation laws imposed upon the employer liability for those injuries arising out of and in the course of employment that were made compensable by the statute. They deprived the employer of his common law defenses and also deprived the em-

ployee of his right of common law action for such injuries, limiting the amount of compensation payable to the injured employee but assuring him of weekly benefits payable over a fixed period of time.

The laws of the several States, the Longshoremen's and Harbor Workers' Act, and the Federal Employees' Act are not uniform with respect to their provisions. Some provide compulsory insurance, while some provide elective insurance. Most laws grant certain exemptions based upon the number of employees. Some exclude farm workers from the benefits provided by the law. Some provide compensation for all occupational disease; others limit compensation to scheduled diseases. These laws vary with respect to the waiting period between the date of injury and the date for the beginning of payment of compensation. Length of time and amount of payment of benefits vary for temporary total disability, permanent partial disability, permanent total disability, and death (1,2).

The original acts contemplated coverage for accidental injuries, that is, for trauma occurring at a specific time and at a specific place while the worker was in the employ of a specific employer. By judicial construction and legislative amendments, these statutes have been gradually extended to cover occupational diseases. But what is an occupational disease? While the term has been the subject of many definitions, the basic concept is that it is a disease characteristic of and peculiar to a given employment. The fact remains, however, that many diseases of human life that may be contracted by the employee in his employment have been the subject of awards of compensa-

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tion under these statutes. The trend of commission and court decision has been liberal in favor of a given claimant; in practice the burden of proof rests upon the employer and insurer to prove that the disease or injury did not arise out of and during the course of employment or is otherwise compensable under the statute.

"Injury"

Again, there is concern as to the legal concept of the term "injury." The following quotations from judicial decisions are indicative of legal construction of that term:

"'Injury' as used in Workmen's Compensation Act and as applied to a human being, includes whatever change in any part of the system which produces harm or pain, or lessens the facility of natural use of any bodily activity or capability." *McLean's case*, 93 N. E. 2d 233, 234, 326 Mass. 72.

"In common speech the word 'injury' as applied to a personal injury to a human being, includes whatever lesion or change in any part of the system produces harm or pain or a lessened facility of the natural use of any bodily activity or capability." *Furlong v. O'Hearne*, D. C., Md., 144 F. Supp. 266, 270.

"Acceleration, aggravation, or lighting up of preexisting disease as a result of employment is 'injury' for which full compensation is recoverable for entire disability suffered." *Tanenbaum v. Industrial Accident Commission*, 52 P. 2d 215, 216, 152 Oreg. 205.

"An employee, helping to erect a stone crusher, made several trips in carrying water in buckets, and then undertook to carry, from a wagon to a car, bags of coal each weighing approximately 150 to 200 pounds. The first to be taken was handed to him and carried to the car. The next bag was rested by the passer on the rim of the wagon wheel. The employee reached to take it from the wheel, and a minute later he was lying on the ground in a dying condition. The medical examiner testified that the employee's heart muscle was tired and exhausted at the time of his last work, and that his final exertions caused the inability of the heart to perform its work. Testimony of two physicians justified this assumption. Held to

sustain a finding that the death of the employee was caused by 'injury,' within the Workmen's Compensation Act." *In re Fisher*, 108 N. E. 361, 220 Mass. 581.

Summarizing the legal construction of this term, it may be said that our courts generally construe the term to mean "harm to any part of the body."

"Disability"

For the legal concept of the term "disability," we again find different definitions. The admitted purpose of compensation statutes is to propose an amount of compensation to be payable in terms of a percentage of the loss of wage. This is peculiar to all of our statutes and follows the pattern of the laws adopted by the British House of Commons, which form the precedent of the adoption of our laws (3). Therefore, in the administration of the laws originally enacted in this country the basic purpose was to relate compensation for disability arising out of and in the course of employment to the wages earned by the employee during that employment. The trend of our commissions, legislators, and courts has been to differ from that concept, and today we find three distinct concepts of the term "disability" recognized in different States:

1. Inability to earn full wages.
2. Total inability to perform any other work.
3. Actual incapacitation of an employee from performance of his work in the last occupation in which he was engaged.

There is a growing tendency on the part of administrative agencies to divert from the principle of awarding compensation based on loss of wages, and to compensate for injury irrespective of wage loss. In certain States, appellate procedure provides for jury trials, and the tendency to construe compensation claims as damage cases has developed.

Illustrative of this point, we find the following concepts of "disability" in court decisions:

"The word 'disability,' as used in Workmen's Compensation Law, means impairment of earning capacity, and not loss of a member, and is that which disqualifies an employee from doing work in whole or in part." Comp. St. 1929, Sections 48-101 et seq., as amended. *Wilson v.*

Brown-McDonald Co., Neb., 278 N. W. 254, 261, 116 A. L. R. 702.

"'Disability' may result as well from the condition of the mind and nerves as from other causes, and where a man is so inattentive or forgetful as a result of mental disorder that he cannot be trusted to carry on even simple forms of work he is as 'disabled from earning a livelihood' as one who must refrain from work on account of the condition of his vital organs." *United States v. Taylor*, C.C.A.N.C., 110 F. 2d 132, 134.

"'Disability' within Compensation Act occurs when employee is disabled from rendering further service by present physical inability to perform work in usual and customary way, and in absence of such disability, employee sustains no compensable injury though employment may have subjected him to exposure which contributed to ultimate disability from occupational disease." St. 1931, Sections 102.01, 102.03 (1) (a). *North End Foundry Co. v. Industrial Commission*, 258 N. W. 439, 217 Wis. 363.

"The test of 'disability' under the Louisiana Workmen's Compensation Act is whether employee can do same type of work he was doing at time of his accident in the customary way without an unusual difficulty or pain." *Strickland v. W. Horace Williams Co.*, C. A. La. 230 F. 2d 793, 797.

One of the sequels to these changing concepts of disability is the adjudication of claims for compensation as claims for damages, and, until this trend is reversed, the potential of claims arising under our workmen's compensation statutes will be staggering. The result of this tendency is to administer our workmen's compensation statutes as health insurance statutes. Certainly this was not the original purpose of the enactment of such statutes. If that objective is socially desirable, it would seem proper to amend the laws, changing the designation from workmen's compensation laws to health insurance laws.

Role of Industrial Physician

Generally speaking, industrial medicine has been something of a stepchild of the medical profession. Doctors eminently qualified in par-

ticular phases of medicine have been and are reluctant to become involved in any controverted case where a lawsuit or compensation claim arises. Most doctors do not wish to appear as witnesses in court or commission hearings. They resent legal cross-examination and the controversion of their opinions by other members of their own profession.

The basic issues in compensation claims are twofold:

1. Whether or not the claimant sustained injury arising out of or in the course of employment.

2. The nature and extent of disability.

The second issue involves the determination of medical questions. Either side is permitted to offer such medical testimony in support of its claim as the litigant deems proper or necessary. Frequently, conflicting testimony is presented. For example, Dr. A, in support of the claim, may take the unqualified position that employment and injury were related; Dr. B, controverting that opinion, may be just as firm in his opinion that there was no such causal relationship.

What can be done to evaluate properly such medical testimony? As illustrative of the role that industrial medicine may play in this matter, consideration is given to heart disease and the pneumoconioses, which may occur during employment.

Problems in Heart Cases

In the trial of causes involving heart cases, three medical questions frequently arise:

1. Was trauma a factor in the heart attack?

2. Is there a direct causal relationship between employment and the heart attack that may be sustained by claimant?

3. Has employment contributed to the aggravation of an existing heart condition?

In the light of present medical knowledge, there are insufficient data for the proper evaluation of all heart cases.

As to the first question, where trauma is immediately and directly related to the heart attack, there should not be any question as to the compensability of the claim.

As to the second and third questions, authoritative criteria have not been accepted to determine whether there is a direct causal relation

between employment and a heart attack, or whether employment has contributed to the aggravation of an existing heart condition. With respect to these questions, courts and compensation commissions are perplexed in their attempts to administer justice when confronted with conflicting medical opinions. As indicative of these problems, reference is made to papers presented by Brig. Gen. Thomas W. Mattingly, now chief of the Department of Medicine at Walter Reed Army Hospital, and Dr. Richard J. Clark, member of the Rehabilitation Committee of the American Heart Association (4). Summarizing his discussion of the pathogenesis of heart disease, General Mattingly made the following statement:

"When the exact cause of heart disease is known, there are few occasions where the cause can be directly related to work in general or to a specific occupation. In many instances where the exact cause of heart disease is not known, there has been much speculation as to this relationship and many unjust and conflicting medical opinions and legal decisions may have resulted.

"The natural course of heart diseases has been stressed in the hope that it will provide a better understanding of the problem of aggravation of preexisting heart disease. This appears to be a major obstacle in appropriate employment of the known cardiac patient as well as adjudication of claims arising from his subsequent disability and death. It is believed that a more appropriate, workable, and equitable system should be evolved for the solution of this problem than that provided by the Workmen's Compensation Act and Associations of Industrial Accident Boards and Commissions. This will be necessary before the economy and health of any nation and its unfortunate cardiac inhabitants can profit by suitable employment."

Dr. Clark, who participated in the panel discussion, made the following statements:

"First, what types of cardiac death or disability may be clearly and completely related to work? Penetrating wounds of the heart, incurred in the course of employment, leave no room for debate. When there is nonpenetrating injury to the chest, which is followed within a few hours by disability and clear-cut electro-

cardiographic evidence of heart muscle or pericardial damage, or in the case of death where autopsy reveals laceration or rupture of any portion of the cardiovascular system, causal relationship may be reasonably assumed. Clear evidence of acute heart involvement or death from electrical shock, toxic gases or other poisonous agents, incurred in the course of employment, indicate direct causal relationship. Relatively rare cases of so-called cor pulmonale, heart disease secondary to pulmonary disease, when this pulmonary disease is clearly of industrial origin, belong in the compensable category. This first group, admittedly a small one, is made up of the conditions where the heart disease is actually caused by industrial work and where compensation should be granted without question.

"In practically every other variety of heart damage, we deal with aggravation of underlying disease, and it is here that tremendous controversy begins. Let us examine circumstances where aggravation may be reasonably attributed to the job. When a patient with any type of heart disease, congenital, rheumatic, hypertensive, or arteriosclerotic, reaches the point of heart muscle weakness, usually associated with enlargement, strenuous exertion or a sudden increase in energy demands, may precipitate acute heart failure, usually manifested by flooding of the lungs and inability to breathe satisfactorily. This may result in sudden death, and by sudden I mean immediate; in this case there is no doubt of aggravation. If sudden non-fatal heart failure develops, there is a situation of disability, temporary but not permanent in character, which is due to the exertion. However, when the acute heart failure has subsided, if the physician decides that the patient can no longer return to his job, it is probable that the resulting permanent disability arises from the underlying disease alone and that the acute heart failure merely pointed up that the patient's reserve was not adequate for the work entailed.

"Apart from acute heart failure, the chief problem is that of coronary artery disease in its various manifestations, which Dr. Mattingly has outlined for you. It is generally accepted that coronary arteriosclerosis is not caused by work."

The above quotations demonstrate the problems confronting courts and administrative agencies in attempting to administer our laws when conflicting medical opinions are introduced into evidence in support of or against the allowance of a given claim.

The Pneumoconioses

The problems resulting from claims for the pneumoconioses received national attention on April 15, 1936, when the Honorable Frances Perkins, then Secretary of Labor of the United States, appointed four committees to investigate silicosis in American industry. The committees considered medical control, engineering control, the economic, legal, and insurance phases, and the regulatory and administrative phases of the silicosis problem. A series of conferences, held in Washington under the direction of the U. S. Department of Labor, resulted in the publication of several reports (5, 6).

From the time the reports of the Department of Labor were published, statutory provisions for compensation for the pneumoconioses have been among the most controversial subjects presented to our legislatures. There is no uniformity under the compensation statutes relating to provisions for the compensation of these diseases or for the method of determining the claimant's disability. Basic to the handling of a workmen's compensation claim is proper diagnosis, evaluation of disability, if any, and the decision as to whether or not the claimant should continue work in which he will be exposed to dust.

The medical profession has found no approved method for curing the disease. It differs from other types of industrial diseases in that it occurs as the result of the accumulative inhalation of fine particles of dust (silicon dioxide) over an extended period of time. This may occur while the employee is in the employ of one or several employers. Similarly, it may occur while the employer is insured by one or several insurance carriers. And the medical profession has found no generally accepted method for the evaluation of disability resulting from the disease.

In many instances, employees have been subject to dust inhalation with demonstrable

evidence of the disease prior to the time that applicable amendments to workmen's compensation acts became effective. This has resulted in various provisions in our statutory enactments that attempt to make special provisions for certain of the foregoing features. Included among such provisions are the following:

1. Limitation upon payments of benefits for the pneumoconioses, as of January 1, 1955 (Arizona, Arkansas, Colorado, Florida, Georgia, Idaho, Illinois, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Utah, Vermont, and West Virginia).

2. Denial of compensation for partial disability (Arizona, Colorado, Florida, Idaho, Maine, Maryland, Michigan, New Hampshire, New Mexico, New York, Ohio, Pennsylvania, South Dakota, and Utah).

3. Monetary limitations for medical benefits (Arizona, Arkansas, Illinois, Nevada, North Carolina, Utah, and Vermont).

4. No provision for medical treatment in cases of silicosis (West Virginia).

Other statutory provisions peculiar to these diseases include the requirement (a) that the employee must have been employed in the given State where claims are made for a fixed period of time; (b) that claim for compensation must be filed within a fixed period of time after last injurious exposure or disability; and (c) that in death cases, compensation is payable only where death has occurred within a limited period of time after the last injurious exposure to the hazard of the disease.

Why have statutory provisions of the types above mentioned been incorporated into law? All persons engaged in industrial operations are exposed in some degree to the inhalation of dust, and with increasing age there may be demonstrable evidence of changes of the lungs which may be interpreted as resulting from or caused by dust inhalation. Impairment of lung function accompanied by increasing age may well disqualify an employee from employment in a dusty trade. Again, a given employer or insurance carrier may assume the risk of accrued or potential liability for the dust inhalation

between employment and a heart attack, or whether employment has contributed to the aggravation of an existing heart condition. With respect to these questions, courts and compensation commissions are perplexed in their attempts to administer justice when confronted with conflicting medical opinions. As indicative of these problems, reference is made to papers presented by Brig. Gen. Thomas W. Mattingly, now chief of the Department of Medicine at Walter Reed Army Hospital, and Dr. Richard J. Clark, member of the Rehabilitation Committee of the American Heart Association (4). Summarizing his discussion of the pathogenesis of heart disease, General Mattingly made the following statement:

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"The natural course of heart diseases has been stressed in the hope that it will provide a better understanding of the problem of aggravation of preexisting heart disease. This appears to be a major obstacle in appropriate employment of the known cardiac patient as well as adjudication of claims arising from his subsequent disability and death. It is believed that a more appropriate, workable, and equitable system should be evolved for the solution of this problem than that provided by the Workmen's Compensation Act and Associations of Industrial Accident Boards and Commissions. This will be necessary before the economy and health of any nation and its unfortunate cardiac inhabitants can profit by suitable employment."

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"Apart from acute heart failure, the chief problem is that of coronary artery disease in its various manifestations, which Dr. Mattingly has outlined for you. It is generally accepted that coronary arteriosclerosis is not caused by work."

have, the confidence and respect of the various communities where legislation of this type would be considered, and upon them rests the primary burden of taking the initiative to find some solution to the problem.

The ideas presented here are of themselves controversial. There is no agreement on them among employers, insurers, or employees, whose interests may be vitally affected by the decisions to be made. There is no agreement among members of the legal profession as to the value of such boards or examiners to advise administrative agencies, and perhaps there are differences of opinion among doctors not only as to the value of such boards and examiners but also as to the ability to get the best qualified members of that profession to serve. However, the primary objective should be the amendment of the laws to resolve these questions in the best manner possible without bias or prejudice and without the attendant expense to which litigants may be subjected in presenting medical testimony. Certainly members of such boards, by their experience in adjudicating cases and studying the industrial conditions complained of, should be invaluable to the administrative agency in its ultimate decision.

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- (6) U. S. Bureau of Labor Standards: National Sili-cosis Conference. Pt. 1. Report on medical control. Pt. 2. Report on engineering control. Pt. 3. Report on economic, legal, and insurance phases. Pt. 4. Report on regulatory and administrative phases. Bull. No. 21. Washington, D. C., U. S. Government Printing Office, 1938.

New Courses in Environmental Health

Eleven training courses in radiological health, air pollution, water pollution, and food sanitation have been scheduled for January, February, and March, 1958, at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

The training courses, part of a continuing program, cover basic education in the environmental engineering field and advanced work in specialized subjects. The first quarter schedule is presented below.

Basic radiological health, January 13-24.
 Atmospheric sample analysis, January 13-24.
 Environmental health aspects of nuclear reactor operations, January 27-31.
 New techniques in bacteriological examination of water, January 27-31.
 Microbiological and chemical examination of milk and dairy products, February 3-7.
 Laboratory methods for prevention and control of foodborne disease, February 10-14.

Detection and control of radioactive pollutants in air, February 17-21.

Detection and control of radioactive pollutants in water, February 24-28.

Advanced training for sanitary engineers in water supply and water pollution, March 3-14.

Air pollution effects on vegetation, March 10-12.

Sanitary engineering aspects of nuclear energy, March 17-28.

Admission of qualified individuals to all courses is governed largely by priority of application. No tuition fee is charged. Applications should be sent to Chief, Training, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati, Ohio.

that the employee may have been subject to in prior employment. Add to this the problems of conflicting medical opinion as to the diagnosis of the disease, evaluation of disability resulting therefrom, and prognosis in a given case, and it will be readily understood that with respect to statutory provisions compensating the pneumoconioses, a problem separate and distinct from other types of injuries or occupational diseases is presented to the administrative agencies.

There is general agreement among employers and employees that occupational diseases, including the pneumoconioses, can and should be prevented. In modern industry it is simply good business for the employer to place high on his agenda the establishment of a division of industrial hygiene or department of engineering control for the purpose of determining and controlling all occupational hazards to which the employee may be subject. The administration of such departments leads inevitably to decreased compensation costs and better industrial relations. Employees are justly demanding clean, safe places in which to work and safe tools with which to work; State and Federal departments of health and labor are giving more and more attention to the conduct of industrial operations to the end that the health of employees may be properly protected. Some occupational diseases can be cured; some cannot. Some become the primary factor in the death of the injured employee; with others the disease so sustained may be aggravated by some other condition, or it may aggravate an existing health condition.

Since the primary questions concerning claims for the pneumoconioses or other occupational disease are medical, involving diagnosis, evaluation of disability, and the factor of the disease in causing death, we again raise the query in determining compensability of the claim, "What agency can best resolve these questions?"

Medical Boards

Compensation administrative agencies and courts generally are composed of lawyers who must reach decisions from conflicting evidence. In certain cases, questions of medical fact may

be submitted to juries for determination. Recognizing the importance of the medical issues in compensation claims, the statutes of many States now make provision for medical boards and medical examiners to pass upon controverted medical claims, to resolve controverted medical claims, or to advise the administrative agency which seeks independent and impartial decisions. In most controverted cases, honest differences of medical opinion may exist between the doctor testifying on behalf of the employer or insurer and the doctor testifying on behalf of the claimant employee. Therefore, medical examiners interested only in obtaining justice for the litigants would seem to be best qualified to resolve the medical issues that are presented by the claim.

Differences exist in the statutes of various States relating to the role that medical boards or medical examiners may play in administration of the law. Some statutes provide for hearings before medical boards with the right of appeal upon these issues to the State administrative agency. Some permit the ultimate appeal to courts for the final determination of medical facts. Some statutes provide that the medical examiners shall act in an advisory capacity to the administrative agency. There is no uniformity in these provisions, but legislative recognition is being given to the importance of this feature of the law so that necessary amendments may be made to take advantage of independent and impartial medical opinion.

There should be no attempt to exclude from the record in a given case the testimony of any doctor which is offered by one of the litigants, for the administrative agency would certainly benefit by the advice of such a medical board or medical examiner in the ultimate evaluation of that testimony in its relationship to the issues presented in the claim.

This raises the question as to how the suggested result may be achieved. The answer is that it can be accomplished only by legislative amendments to make adequate and proper statutory provisions for the establishment of medical boards or examiners. Perhaps the most significant role to be filled in the accomplishment of this objective is that to be played by our medical societies. They have, or should

is and not remade, and finally that he wants to be given the respect to which he feels entitled. All of these thoughts and feelings have a profound influence on both the employee and the employer.

Employment Practices

In any consideration of employment practices specifically with reference to the part played by the age factor in the hiring of workers, a number of related factors must be recognized. A company's attitude toward hiring elderly workers is probably influenced by its experiences with the retirement of its employees. Other factors include the physical demands of the particular job, the condition of the labor market, company size, and the type of industry.

Moreover, when no policy with regard to age exists, decisions are made by the employing staff on individual cases. Such decisions may be influenced by the worker's previous length of service with the company. The worker who has grown old in service is viewed differently from the elderly applicant new to the company.

It will be agreed that employment practices are determined by a number of factors, some known and others probably unknown to management itself.

Newspaper "Help Wanted" Sampling

A reading of one day's help wanted section of a Washington newspaper showed that 87 percent of a sample of 132 advertisements for men workers made no reference to age; the corresponding percentage for a sample of 120 women workers was 88 percent. For men, 13 notices specified that the worker be under 45. These were classifiable according to job as follows: professional and managerial, 4; clerical and sales, 6; and services, 3. For women, 14 notices required workers under 45, with 2 in the professional and managerial group, 10 in clerical and sales, and 2 in services.

Similarly, a New York newspaper revealed no reference to age in about 95 percent of 375 notices for men, and a similar percentage for 1,361 women. Ages under 35 were specified for 13 men, 3 in the professional and managerial group, 9 in clerical and sales, and 1 in the un-

skilled group. For the women, 70 of the 1,361 notices required workers under 45 years of age, 10 in the professional and managerial group, 58 in clerical and sales, and 2 in services. More than half of the notices requiring clerical and sales workers under 45 specified a "young" woman.

From this newspaper sampling it would seem that a large majority of work establishments did not consider age as a factor in the employment of men and women for certain types of work.

A striking contrast is afforded by the job-opening specifications of the local employment office in seven metropolitan districts representing a nationwide sampling (4). Of the 21,000 jobs listed in April 1956, 40 percent specify under 45 years as a maximum age limitation, with little distinction between percentages for men and women. The percentages for certain occupational groups regardless of sex follow: clerical, 57; professional and managerial, 45; service, 35; semiskilled, 33; and skilled, 15. Should the skilled classification be omitted, it will be noted that the proportion of listings specifying a maximum age limitation varies from about one-third for the semiskilled group to more than one-half for the clerical. The relatively low percentage for the skilled classification undoubtedly reflects the growing shortage of skilled workers in many occupations (5).

Pennsylvania Survey

The Pennsylvania survey obtained information on the age factor in employment from interviews with 358 establishments comprising more than a million Pennsylvania workers (6). The report pointed out that it is a common practice to establish age barriers to hiring. The percentage of establishments with more than 1,000 employees for different industrial groups imposing hiring restrictions because of age is given below.

| <i>Establishments</i> | <i>Percent with hiring restrictions</i> |
|-----------------------|---|
| Mining..... | 70.0 |
| Service..... | 66.7 |
| Finance..... | 57.0 |
| Trade..... | 53.0 |
| Transportation..... | 53.3 |
| Manufacturing..... | 49.2 |

Source: Based on part of table 3, p. 41, reference 6.

Employment and Retirement of Elderly Workers

W. M. GAFAFER, D.Sc.

IT is now common knowledge that the proportion of persons in the older age groups has been increasing. In 1900 the age group 45-64 years contributed 13.7 percent to the total population; in 1955 the corresponding percentage was 20.2. The group aged 65 years and over constituted 4.1 percent of the population in 1900, the percentage gradually increasing to 8.5 in 1955 (1). Moreover, in 1890 as many as 68 percent of the men aged 65 and over were in the labor force; in 1955 the corresponding percentage was less than 40 (2). These facts have given rise to what has been known for some time as the problem of the aging worker.

It has been stated that the adoption of certain employment and retirement policies has retarded a solution of the problem (3). Under such policies, an increasing body of persons, willing and able to work, may well be lost to the labor force. Hence the potential production as well as the purchasing power of this increasing proportion of the population would be sacrificed. In addition, the question arises of the possible deterioration of the social and

economic well-being of this group with all of the attendant implications.

This paper presents some material on hiring and retirement practices based essentially on correspondence with a small sample of industries and on the results of two published surveys. It is hoped that the practices as presented, together with the bibliographic material, will be helpful in the quest for a solution of this urgent problem.

Employer and Employee Viewpoints

The problem of the aging worker, as one might suspect, is met differently by the employer and the employee. The employer thinks of possible changes in hiring and placement procedures, the optimum employment of the worker as he ages, the effect of aging on work performance, what his responsibility should be with regard to practices before and after retiring, the attitude of older workers toward retirement, the increasing costs of pensions, and changes in retirement policies.

The employee, on the other hand, has another complex of thoughts. He is concerned with the question of adequate income when the retirement age is reached. He is deeply concerned with what his health status and that of his family will be during retirement. In addition to the economic and health aspects there are the psychological ones generated in the workshop and home environments, and deeply conditioned by the feeling that the employee wants to be understood, that he wants to be accepted as he

Dr. Gafajer, technical adviser, Occupational Health Program, Public Health Service, participated in the founding of the Journal of Gerontology. He is a member of the Journal's advisory editorial board and was chairman of the task force, 1951-54, established to draft a program of study for determining the work capacities of older persons. He participated in the workshop on health and criteria for retirement, Ninth Annual Conference on Aging, University of Michigan, July 9-11, 1956.

desirable in its early deliberations on retirement practices to organize special programs for the preparation of employees for retirement. Currently, however, the company believes that the essential preretirement counseling can best be conducted through previously established continuing appraisal and counseling programs paying due respect to any individual differences that might occur among the group ready to retire. The company considers compulsory retirement desirable and recognizes that separation from service can be made a satisfying experience only if the separation is approached as a mutual interest. Considerable emphasis is placed on the emotional and financial aspects. Interest is also shown in visits by company representatives to the homes of retired employees to determine the effectiveness of any counseling that might have been performed; such visits are scheduled to occur 1 month, 6 months, and 1 year after retirement, and annually thereafter.

The steel company reported that it does not conduct preretirement or postretirement counseling or educational programs.

The insurance company indicated it had a "makeshift" retirement program with a normal retirement age at 65 for men and 60 for women. Management has been given the authority to retain until his 68th birthday a male employee, at the employee's request, at suitable employment depending on physical condition and aptitude; the corresponding age for women is 65. When these ages have been attained, the board of directors alone may request the employee to continue to work under terms laid down by the board. A relatively large number of persons have been kept at work after age 65. The company reports that substantially nothing has been done in the preparation of employees for retirement although the personnel department has had some contacts with a professional counselor on the subject.

Like many other companies, the manufacturer of transportation equipment uses as a basic tool the series of seven booklets issued under the title, *My Time Is My Time* (8). The booklets, generally distributed among the employees at intervals before actual retirement, deal with such subjects as the need for a long preparation for retirement, a review by the

employee of his job and of the company for which he works, life insurance and other investments, health, budget making, housing, occupations and hobbies, and restlessness and boredom. The booklets emphasize the strong need for the development of a frame of mind leading to a full and rewarding life after retirement.

The department store subscribes to voluntary retirement. Its workers are privileged to continue working after the age of 65 provided their health and production are maintained. Information on these subjects is developed from an annual physical examination performed by the store physician and a yearly review of performance on the job. Annual interviews on questions of retirement are held with workers 64 years of age and over during the month of their birthday. In addition nine conferences of 1½ hours each, on company time, are devoted to the subject of preparation for retirement.

Retired workers retain all of the privileges they had while working in the store including the usual shopping discounts, group insurance, visits to the medical department, legal department services, and receipt at their home of the monthly house organ.

The store emphasizes the importance of gaining the confidence of employees in the purposes of the retirement program. Moreover, it is insisted that the retired worker continue to feel a part of the organization. In this connection birthdays are remembered and Christmas gatherings are held at which gifts are distributed. Management feels that such activities on their part have a profound, beneficial effect on the morale of the entire force.

The maker of chemicals and allied products feels that no definite plan has been adopted for preparing workers for retirement, and that none of the plans that have come to his attention is sufficiently appealing to warrant adoption; furthermore the correspondent refers to the fact that in a number of companies where lectures and counseling had been used in efforts to provide some preparation for retirement, the programs were terminated after a few years of experience with them. However, the company has urged all of its physicians to discuss retirement plans with workers at the time

It will be noted that the percentage varied from a maximum of 70.0 for mining to a minimum of 49.2 for manufacturing. Two-thirds of the service establishments had age restrictions as did more than half of finance, trade, and transportation.

The reasons for adopting the policy of imposing hiring restrictions given by establishments with more than 1,000 employees are presented in the table. It will be seen that the chief reasons are physical factors and pension costs. Attention is directed also to the relatively large proportion of establishments giving no reason for imposing restrictions. Reluctance to furnish this information probably reflects the lack of objective support for the adopted policy.

Current Hiring Practices

Some pertinent information was received by correspondence with a company engaged in the making of electrical machinery and equipment, a steel fabricator, an insurance company, a manufacturer of transportation equipment, a department store, and a maker of chemicals and allied products.

The electrical machinery producer, the transportation equipment manufacturer, and the department store did not refer to the adoption of any age policy with regard to hiring.

The steel company indicated that it fills job requirements by selecting from the available labor force those applicants best qualified to perform the work safely.

The insurance company, primarily a compensation insurer, reports that so far as the company is concerned, policyholders could and

should employ handicapped persons be they handicapped from accident, disease, or age.

The chemical producer indicated that the policy is followed of hiring the right man for the job regardless of age, adding that the age factor, as well as physical handicaps, is often confused with the more basic issue of the applicant's having nothing to offer which justifies his employment.

Thus, from this small sample of industries employing thousands of workers, it would seem that there is no agreement on the age factor in the hiring of workers.

Retirement Practices

That it should assist workers in adjusting to retirement seems to be an increasingly accepted responsibility of industry. In 1948 there were relatively few preretirement programs. According to the results of a nationwide survey, more than 50 percent of the companies in the sample had by 1952 some kind of preretirement counseling; by 1954 the percentage rose to 65 with 35 percent of the companies reporting that their interest extended to making one of their employees responsible for visiting retired workers (7). As in the instance of employment practices, there are probably a number of factors known and unknown to management which determine the retirement practices currently followed.

Current Retirement Practices

The six companies referred to above also provided some information on retirement practices.

The electrical machinery producer found it

Percentage distribution of establishments with over 1,000 employees imposing hiring restrictions because of age, according to reason for restriction

| Reason | Mining | Service | Finance | Trade | Transportation | Manufacturing |
|--------------------|--------|---------|---------|-------|----------------|---------------|
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Physical factors | 56.0 | | 33.3 | 50.0 | 25.0 | 34.1 |
| Pension costs | | | | 16.7 | 50.0 | 13.1 |
| Training time | | | | | | 8.2 |
| Insurance costs | | | | | | 1.6 |
| Production quality | | | | | | 1.6 |
| Production rate | 15.0 | 50.0 | 66.7 | 16.6 | | 14.7 |
| Other factors | 29.0 | 50.0 | | 16.7 | 25.0 | 24.8 |
| No reason stated | | | | | | |

SOURCE: Based on part of table 3, p. 41, reference 6.

ing proportion of elderly persons in the population has produced new social stresses and strains. There is no homogeneity in the solutions offered by industry to the two major issues of employment and retirement of the older worker, indicating not only the complex nature of the problem but also the lack of factual material upon which to base a solution. As the problem becomes ever-increasingly urgent progress will be forced, through the accumulation of experiences, leading eventually to the effective use of the skills of the elderly worker and to a full life in the retirement years.

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of annual physical examinations. Among the items emphasized are choosing satisfying activities long before retirement, considering retirement as equivalent to a change in job and as an opportunity to engage in long postponed activities, and the cultivation of patterns of thinking and motivation which increases the retired employee's usefulness to others.

Survey of 657 Companies

A survey was recently conducted of company practices related to older workers and retirement (9). The 657 cooperating companies, located primarily in the East and Middle West, and constituting some 2.5 million employees in the major industrial groups, were selected so that added weight was given to the manufacturing industries and, to some extent, the larger companies. A review of the survey findings not only indicates the extent of such practices but also reveals the kind of practices engaged in by the companies sampled.

In their efforts to prepare employees for retirement, 19 percent of the companies diminish the workloads and increase the free time of employees as they approach retirement age. Sixteen percent make use of hobby shows, publish appropriate articles in their house organ, establish service clubs, present service awards, or give dinners for those retiring. Thirteen percent introduce vocational training for different kinds of work, and less than 3 percent initiate programs on retirement needs.

With regard to preretirement counseling, 54 percent of the companies have interviews with employees on the subject of retirement. In 45 percent the interview covers the amount of pension to be expected and in 34 percent retirement financial problems are considered. Eight percent have a minimum of 2 interviews with the first occurring at least 1 year in advance of the date of retirement.

The question of company contact with the employee after he retires also was raised in the survey. Forty-one percent of the companies encourage retired workers to return for discussion of their problems; 24 percent send out Christmas, birthday, and sympathy letters, company notices, and various kinds of invitations; 22 percent offer financial aid; 15 percent make available their employee social fa-

cilities; and 13 percent mail out letters on plant developments.

The 657 companies reported 475 life insurance benefit plans in effect for active workers. About one-third of the plans made available to retired workers the full amount of benefit at no cost, at the same cost, or increased cost; fewer than one-third provided a reduced amount of benefit under similar cost conditions.

A total of 476 plans indicated health insurance benefits in effect for active workers. About 15 percent of the plans made the full amount of benefit available to retired workers at no cost, at the same cost, or increased cost; about 3 percent provided a reduced amount of benefit under similar conditions.

Necessity for Adjustment Programs

One of the observations that might be made from a review of company practices is that there is no unanimity of opinion with regard to the necessity for retirement adjustment programs.

Those not in favor of retirement adjustment programs believe that such programs, although designed to cushion "retirement shock," actually create apprehension in the employee approaching retirement, that long before his retirement he is made to feel that he will be superannuated at a specific age, that the feeling is implanted that retirement will be utopian in character, that the employee's interest in his job may diminish as he rides out retirement, and that in any regard retirement adjustment activities are not the responsibility of management and the concomitant counseling is an invasion of the employee's privacy. Furthermore, as one executive stated, if the employee approaching retirement has problems with which he could have been helped earlier through the established management or community agency channels, he is not likely to benefit from any adjustment program (?).

On the other hand, as pointed out earlier, the proportion of industries subscribing to retirement programs is increasing for reasons that are known as well as unknown to management.

Conclusion

It is unnecessary to belabor the observation made more than a decade ago that the increas-

Industrial Medicine

LEO WADE, M.D.

THE relationship of certain diseases and injuries to occupation has been recognized for hundreds and perhaps thousands of years. With the industrial revolution, first in England and later in this country, the frequency, number, and complexity of such medical problems grew tremendously. The advent of workmen's compensation laws early in the 20th century caused many managers of large industrial plants to seek implant medical services. These were usually provided by a full-time nurse and a part-time or on-call physician.

The most obvious and most costly medical problems were those secondary to trauma. It is not surprising then that the early implant doctors were almost always general surgeons whose chief function was the repair and rehabilitation of injured workmen.

Economic, humanitarian, and moral considerations led most managements, with the aid of physicians, hygienists, and safety engineers, to seek ways of preventing injury on the job. The success of these efforts is reflected in the striking increase, during the last 50 years, in the industrial worker's average life expectancy. It is now comparable to that of those not so employed, largely as a result of preventing trauma. Except for occasional dramatic revelations, industrial factors leading to chronic medical disabilities were unrecognized until relatively recently.

One may say with certainty today that any job required by industry can be done without harm or injury to the worker. This conclusion is corroborated by the observations of many effective industrial medical departments. Dis-

ability secondary to occupation accounts for fewer than 5 percent, and in some instances 1 percent, of all disability cases (1). Careful study of disability secondary to occupation in such plants invariably reveals errors in judgment or performance of the injured workman himself or of one or more of his fellow workers. The frequent accumulation of millions of man-hours in industrial plants without a single disabling occupational illness or injury gives credence to the belief that occupational disability can be all but eliminated.

Growth of Implant Medical Services

In spite of the marked decrease in the frequency of occupational injury and disease, the number of physicians employed by industry has increased tremendously in the past 15 years.

The growth of industry itself might well account for an increased number of plant doctors even though the need for their services has declined. And although the relative frequency of occupational disease has been decreased, such disease has not been eliminated. Even the remote possibility of occasional disaster in historically hazardous industries causes some managers to maintain a readily available medical staff.

Chiefly, however, the increased number of physicians in industry is the product of new concepts of the possible roles of medical services in industry. For example, some managements have yielded to the organized demand of workers for complete therapeutic implant medical services at management expense as a fringe benefit in lieu of salary increases. In other instances, varying amounts and kinds of

Dr. Wade is medical director of the Esso Standard Oil Co., New York.

to make the most effective use of local union and community resources, and to make the benefits of the program available to all retired UAW members and to other retired persons in the community.

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Presents graphically population trends and some implications of the age factor in manpower utilization.

Beryllium Case Registry

The Beryllium Case Registry at the Massachusetts General Hospital in Boston was established in 1952 to correlate work exposures causing beryllium poisoning, to delineate its clinical character, to evaluate treatment, and to increase knowledge of the prognosis of the disease. The registry is supported by the Division of Biology and Medicine, Atomic Energy Commission.

Through the registry's data on beryllium poisoning, industrial plants and Government agencies that wish to continue using certain beryllium compounds can learn of measures necessary to prevent the disease. To increase its usefulness, the registry seeks original chest X-rays and biopsy or autopsy material. By its study of accumulated knowledge of cases and by assaying tissue and body fluids for the presence of beryllium, the service has already done a great deal to assist physicians in diagnosing beryllium poisoning. Physicians and medical students are always welcome to study the registry's data.

Beryllium poisoning is of interest in itself and also because it mimics other granulomatous diseases such as tuberculosis and sarcoidosis. With the etiology of beryllium poisoning known it may be possible by clinical investigation and by animal experimentation to expand knowledge of the pathogenesis of a group of

diseases difficult to classify and study. It is not yet known how low a level or how short a time of exposure can produce the chronic illness.

There are 528 cases of beryllium poisoning in the registry; 225 are acute and 303 chronic. Cases are entered by number so that the physicians and patients are anonymous. Questionnaires are used in obtaining both original and followup data. The registry may pay for copying original records or for clerical help. Cases are followed annually, through the family physician whenever possible.

Because of the steps industry has taken to prevent exposure to toxic compounds, few if any cases of acute beryllium poisoning are expected to be reported in the future. Chronic beryllium disease, however, continues to appear because of the delay between the last exposure to the compound and the onset of illness.

In the continuing search for new cases of beryllium poisoning or for cases not previously recognized as related to earlier exposure to beryllium, the registry seeks the interest and help of private physicians and public health officials.

Beryllium has assumed industrial significance because of its expanding uses in the construction of nuclear reactors and its effects on the resilience of copper.

—HARRIET L. HARDY, M.D., *associate physician in charge of the occupational medical clinic, Massachusetts General Hospital.*

ronment also includes people—those with buoyant health, the partially disabled, people with personal and social problems or with inadequacies of mentality or emotional adjustment. These workers, as individuals can contribute to a safe and healthful working environment, or they may present a hazard to themselves and to their co-workers. Thus, the employee with tuberculosis or the crane operator with epilepsy can do irreparable harm to his fellow workers. Even a chronic though innocent clash of personalities may be disrupting to the production goal. A sound and comprehensive approach to the working environment involves not only the use of accepted engineering and public health practices but also the practice of good clinical medicine.

A clinical means of providing a safe and healthful working environment is the medical examination program. The basic objectives of such a program should be:

- Elimination of health hazards introduced by virtue of medical defects in the individual employee.

- Early detection of any evidences of health impairment arising from possible inadequacies in the engineering control of health hazards.

- Instruction and guidance of individual workers reporting for examination on proper safeguards to their health so far as occupation is concerned.

- Use of medical information obtained to prevent or control nonoccupational disease.

It is customary to examine the worker (a) prior to employment or placement, (b) upon return to the job after absences due to injury or illness, (c) at appropriate intervals during the course of employment, and (d) prior to retirement or other termination of employment.

The preplacement or preemployment examination is almost always a part of the hiring procedure in industry today. There is still a difference of opinion, however, among both managers and physicians in industry regarding the objectives of such examinations. Some insist upon all applicants measuring up to certain minimal standards of physical health. Thus, in some plants an applicant with one or more physical defects, such as an old mitral stenosis or healed tuberculosis lesion, would be automatically excluded from employment. In

my opinion this is justified under some circumstances, but usually it is not. Individuals with these or other lesions may be better qualified by training and aptitude to do the available job than other candidates. The medical department should be satisfied if the prospective employee can do the proposed job without hazard to himself or his fellow workers. There is no reasonable basis, however, to assume that such partially disabled persons are more satisfactory workers than those without such defects.

Workers returning to the job after losing time because of sickness or injury should be reevaluated along similar lines. Although such employees should be more useful than the neophyte because of training and experience, they should be able to do their old job in its entirety without contributing a new hazard to the working environment.

The periodic health examination should also be done with full attention to the occupation of the worker. This is equally true whether the employee is subject to the tensions of a boardroom conflict of ideas or the fumes of the lead burner. In either instance, the alert physician in industry will be on the lookout for evidence of uncontrolled or inadequately controlled environmental hazards on the job, as well as any signs that the worker himself is influencing the working environment adversely for his fellow workers.

Some industrial medical departments have segregated the occupational component of the periodic health examination, in the form of the "toxic" examination, an abbreviated periodic examination with attention focused on the job assignment rather than the employee. This approach is wasteful of both doctor's and employee's time, since it necessitates two or more separate visits to the medical department. It assumes that all potential adverse influences of the job on employee health are well documented and easily recognizable physicochemical ones. There is little opportunity or stimulus left to recognize previously unknown environmental influences. The toxic examination focuses the employee's attention unnecessarily on the potential job hazard, stimulating unwarranted anxiety in many instances. Under such circumstances, one may question the justification of doing the periodic examination at all.

medical services have been provided in efforts to reduce the cost of sickness absenteeism. Most important are the preventive medical programs designed to supplement the therapeutic medical services already available to the worker in the community. The goal of such preventive industrial medical services is to keep the maximum number of workers on the job performing at optimal levels.

Unfortunately, the average person groups all these varieties of medical activity, and still others, under the single label of "industrial medicine." The physician who carries on any of these activities in an industrial setting is known as an industrial physician. Some refinement of terminology is possible and very desirable.

Industrial and Occupational Medicine

I suggest that the term "industrial medicine" be used to designate that variety of medical practice which deals primarily with the treatment of injury or disease resulting from peculiarities of the working environment and for which the employer assumes a moral and legal responsibility.

Almost all practitioners of medicine are called upon from time to time to treat "industrial cases" and might well be considered, therefore, "industrial physicians." It is impossible to define industrial medicine or surgery in terms of disease entities. Disease or injury occurring as a result of defects in the working environment is in no wise different from that which occurs among persons who have never been employed in industry. A strategically placed roller skate on the cellar stairs may lead to the same injuries as an improperly assembled scaffold on the job. Solvents improperly used to clean the living room carpet may produce the same liver damage and bone marrow depression as when used without proper ventilation in the plant. Proper treatment is the same, and the potentialities for permanent disability or even death are the same. The fact that there is workmen's compensation should not affect the medical care or the end result.

The term "occupational medicine," on the other hand, should be used to designate that variety of medical practice concerned primarily

with the prevention and control of both occupational and nonoccupational disease, and not with the treatment of either. Occupational medicine was recently defined as "that branch of medicine which deals with the relationship of man to his occupation, for the purposes of the prevention of disease and injury and the promotion of optimal health, productivity, and social adjustment" (2). True occupational medical services are not bargainable fringe benefits. They are essential tools of management for the effective and safe use of workers in industry.

Physicians in industry may be engaged in industrial medicine, occupational medicine, therapeutic medicine (in competition with the private practitioner), or various combinations of these.

Techniques of Occupational Medicine

For many, industrial and occupational medicine consist of myriads of routine physical examinations and reams of paper work. While both are essential activities in any adequate occupational health program, they are by no means the most basic elements. The peculiar contribution which the physician in industry can make is the maintenance of a safe and healthful working environment. The accepted methodology of public health and environmental medicine provides the framework for the development of safe working practices as well as for proper design and engineering of industrial processes.

The materials used in a given industry or plant, as well as the intermediary and final products, must be known to the plant physician. He must be familiar with the possible health hazards associated with the use of these materials. This physician in industry often knows more about the possible health problems in his particular plant or industry than one can find recorded in the textbooks. He has an obligation to management, the employees, and to the private practitioners of medicine to share his knowledge in the interest of the employee, the consumer, and the general public.

"Working environment" is usually envisioned in terms of fumes, dusts, gases, mists, solvents, noise, radioactivity, radiant heat, and other physical-chemical agents. The working envi-

logical approach makes possible the identification of previously unrecognized health problems. To illustrate the use of this technique, I have compiled several tables, the first dealing with death rates (table 1). Since a large percentage of the employees of the Esso Standard Oil Co. work and live in New Jersey and Louisiana, attention is confined to those two States. Even with an employee population of more than 25,000, sizable fluctuations in rate may occur. For this reason, a running average over 5-year periods is used for calculations. It is consoling to both management and employees that the overall death rates for employees are lower than those last reported for the State in which they live. The upward variations observed in several specific disease categories are not statistically significant.

Morbidity data also provide a valuable clue to potential health problems in an employee group. For example, table 2 summarizes all cancer cases occurring among Esso employees and annuitants these past 8 years. The average number of cases over 5-year periods is used to smooth out fluctuations resulting from relatively small samples. Overall rates compare favorably with incidence reported in Public Health Service surveys. Rates for individual organ systems (not shown here) are consistently lower than those reported by the Public Health

Table 2. Incidence of cancer among white male employees and annuitants of the Esso Standard Oil Co.

| Disease | Esso employees and annuitants ¹ | | | Expected ² |
|--|--|---------|---------|-----------------------|
| | 1951-54 | 1952-55 | 1952-56 | |
| Total cancer cases... | 397.7 | 395.2 | 369.9 | 370.58 |
| Total cancer cases except for skin.... | 272.4 | 276.5 | 259.5 | 299.78 |

¹ New cases per 100,000 employees per year.

² Based on Cancer Illness in Ten Urban Areas of the United States, Cancer Morbidity Series Nos. 3 and 10, Public Health Service, 1951, 1952. Incidence figures for Hodgkin's disease were not included. The incidence data are calculated for a theoretical population with a 35 percent New Orleans population and 65 percent Philadelphians, approximating the geographic distribution of Esso employees.

NOTE: Incidence figures represent 5-year moving means.

Table 3. Comparison of anatomical distribution and cell type of skin cancers among white male Esso employees and the population at large

| Site and type of cell | Esso (percent) | Expected (percent) |
|----------------------------|----------------|--------------------|
| <i>Cancer site</i> | | |
| Lip..... | 17.0 | ¹ 13.1 |
| Face, head, and neck..... | 64.6 | ¹ 70.1 |
| Extremities and trunk..... | 18.4 | ¹ 16.8 |
| <i>Cell</i> | | |
| Basal..... | 55.8 | ² 53.3 |
| Squamous..... | 36.4 | ² 33.9 |
| Melanoma..... | 3.9 | ² 4.8 |
| Other..... | 3.9 | ² 8.0 |

¹ See footnote to table 2.

² Based on Morbidity from Cancer in the United States, Public Health Monograph No. 29, Public Health Service Publication No. 418, 1955.

Service except for skin. The high incidence for skin is attributable to a special interest in this disease. It is well known that skin cancers are rarely ever diagnosed histologically, much less reported in incidence surveys. Fulguration is a common form of treatment. Our data are based on histological examination of all suspicious skin lesions.

These data were used further to examine the anatomical distribution and cell type of more than 200 skin cancers (table 3). There is no evidence of anatomical localization nor preponderance of cell type which might be expected if the lesions were secondary to industrial exposures.

Such gross data may conceal job-related disease, however, unless careful and constant review of job assignments, for example, is carried on simultaneously. Several of my associates have prepared for publication an epidemiological study which reveals an environmental problem not immediately apparent. I refer to the disease as X. While the plantwide incidence of the particular disease was not striking, the incidence among one group of workers was significantly higher than in the population at large or in the remainder of workers in the same plant. Actually, a previously unrecognized hazard did exist. Incidence rates for disease

Table 1. Comparison of age-adjusted death rates of white male employees and annuitants of the Esso Standard Oil Co., ages 20-99, with those reported for the corresponding State

| Cause of death | New Jersey | | Louisiana | |
|-------------------------------|----------------------|------------------------|----------------------|------------------------|
| | Rate for State, 1950 | Rate for Esso, 1950-55 | Rate for State, 1950 | Rate for Esso, 1950-55 |
| All causes ¹ | 14.94 | 12.77 | 12.80 | 11.10 |
| Primary causes: ² | | | | |
| Cardiovascular disease..... | 904 | 809 | 732 | 729 |
| Neoplastic disease..... | 210 | 260 | 194 | 142 |
| Pneumonia..... | 31 | 30 | 27 | 58 |
| Cirrhosis of liver..... | 23 | 27 | 17 | 2 |
| Peptic ulcer..... | 15 | 14 | 8 | 5 |
| Suicide..... | 26 | 9 | 22 | 34 |
| Diabetes mellitus..... | 19 | 6 | 12 | 3 |
| Tuberculosis..... | 39 | 5 | 43 | 5 |

¹ Per 1,000 population.

² Per 100,000 population.

The preretirement or termination examination can also be used as a check on the adequacy of environmental controls, particularly where there is the possibility of a chronic disease with a prolonged "incubation period." It is particularly helpful, however, in the proper administration of company-sponsored insurance programs and workmen's compensation claims. In some instances, it has dramatically prolonged the life of long-service, faithful employees by recognition of asymptomatic, correctible, but life-threatening disease.

Definite contributions to a safe and healthful working environment may be made through careful attention to dispensary and therapeutic activities as well.

The dispensary services provided by industrial medical departments are an invaluable tool in the early recognition of defects in the environmental control program. It is inevitable that dispensary service cares for countless minor nonoccupational ailments, few of which would find their way to the private practitioner's office. Uncared for, these ailments may be costly in terms of overall employee productivity. A satisfactory rule of thumb for the dispensary nurse or physician is to treat any case not involving loss of worktime and apparently amenable to a single therapeutic effort. All other cases may be referred to the family physician.

The alert physician or nurse in the dispensary may identify sources of illness beyond the control of individual workers. The epidemic nature of some complaints may reveal more than the specific nature of the illness. Thus, 10 cases of conjunctivitis or of "nervous indigestion" all coming from a given unit in a plant mean something different to a plant physician than these same 10 cases would mean to 5 or 10 individual practitioners in the community. In such cases the plant physician has a reasonable chance of correcting the basic cause of the epidemic, while the physician outside can only treat the symptoms.

In the treatment of occupational or compensable disease, obviously the minor cases not involving loss of time can be most efficiently cared for by the plant physician. The referral of cases in which worktime will be lost to appropriate private practitioners on a fee-for-service basis has many advantages for all concerned.

The advent of such devices as punchcard recordkeeping and calculators, has simplified the analysis of clinical data obtained in the industrial medical department. Mortality and morbidity data for the employee group and its various segments may be compared with similar data for the population at large. Thus, the physician in industry has another check on the adequacy of engineering controls for known job-related disease. Similarly, the epidemio-

The Private Physician's Responsibilities in Occupational Medicine

B. DIXON HOLLAND, M.D., M.P.H.

DISTINCTIONS customarily drawn between the physician engaged in occupational health and the private practitioner become less sharp when one compares the extent and the nature of the concern the two have for the health of the same individual—the working man. The distinctions must be further reduced. The full-time private practitioner must engage, under some formal arrangement, part time in occupational health services if the needs of the Nation for such services are to be satisfied.

Private practitioners are engaged in occupational health services to a greater extent than most of them realize. Practically all of them, except pediatricians, have as patients individuals who work for a living. For the correct diagnosis and management of a number of diseases and symptom complexes, the physician must ascertain and assess all the factors that may have played, or may be playing, a role in their etiology or aggravation. Bernardino Ramazzini (1633–1714), the father of occupational medicine, recognized this when he taught that the physician should ask his patient one question beyond those recommended by Hippocrates, specifically “What is your oc-

cupation?” Information to be elicited with this question will help the doctor to determine which of the patient's symptoms and health defects should be charged to his working conditions or environment, and, of possibly equal importance, which ones should not be so charged.

A knowledge of occupational health, therefore, helps the doctor diagnose and treat the illnesses of some of his private patients.

Moreover, the knowledge gained from a familiarity with occupational illnesses may be applied to housewives, hobbyists, and children, who may use, without proper protection or direction, do-it-yourself kits, solvents, dry cleaners, pesticides, paint, paint removers, and similar materials, many of them hazardous. They may suffer, as a result of such exposure, effects similar to those encountered in occupational medicine, and may require similar treatment.

Another consideration requires private practitioners, collectively as well as individually, to be more interested and active in occupational medicine. It is well known that the vast majority of the employed population of this country work in establishments too small to have a full-time or even a part-time physician and hence are denied that protective health service which is the essence of occupational health.

A substantial proportion of such establishments have nurses, but these nurses usually have little if any direction by a physician. A substantial proportion of such establishments also have arrangements with physicians to treat cases of occupational illness or injury occurring

Dr. Holland was a medical officer with the Regular Army from 1937 to 1956, retiring at that time as a colonel. He held positions during that period primarily in preventive medicine. From 1953 to 1955 he was head of the Army's occupational health program. Since July 1956, he has been Secretary of the Council on Industrial Health of the American Medical Association.

X among plant groups engaged in the manufacture of Y are as follows:

| | <i>Incidence per 100,000</i> |
|--|----------------------------------|
| All plant employees----- | 249 |
| All employees engaged in the manufacture of Y----- | 354 |
| All employees engaged in the manufacture of Y with 10 or more years' service----- | 460 |
| Selected employees engaged in the manufacture of Y with 10 or more years' service----- | 1,500 |
| Other employees engaged in the manufacture of Y with 10 or more years' service----- | 247 |
| Males of comparable age in general population----- | 217 |

Summary

The techniques of occupational medicine, engineering controls, evaluation of the toxicity of materials used or produced, diagnostic examinations, dispensary services, the treatment of compensable illness, and epidemiology, are all directed toward the provision of a safe and

healthful working environment. Certain by-products in the realm of nonoccupational disease, such as the occasional dispensary care of minor illness, the early recognition of disease, the provision of health guidance, often seem of great importance to the employee and to management. There is real danger that these by-products may be confused with the basic commodity of occupational medicine. Such confusion must be avoided lest medicine in industry become merely another variety of institutional medicine or a system of medical economics rather than a highly useful and essential medical specialty.

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Study of Environmental Factors in Atherosclerosis

The relationship between hardening of the arteries in the heart of the human being and his living habits and other environmental factors is under study in a joint project of the New York State Health Department and Albany Medical College. Scheduled for the Albany area, the project is based on a pilot study made in 1956 by Dr. W. G. Beadenkopf, assistant director of the bureau of epidemiology and communicable disease control of the State health department, and by Dr. Assaad Daoud, assistant professor of pathology of Albany Medical College.

The degree of hardening of the arteries is being measured in all adults on whom autopsies are performed at Albany Hospital. For this purpose, Dr. Daoud has developed a standardized technique for measuring the diameter of coronary arteries and the amount of deposits on their interior walls. Following postmortem examinations, Dr. Beadenkopf and his staff are seeking information on the living habits of each person autopsied from clinical records and interviews with family physicians and relatives.

The project, which will include more than 1,600 individuals, is part of an expanded effort of the New York State Health Department to study coronary heart disease in population groups.

Employee Health Services

J. F. McCAHAN, M.D.

A STAFF of 9 physicians and 26 industrial health consultants are strategically located about the country to assist policyholders of the Liberty Mutual Insurance Co. in the evaluation and development of implant medical programs. These specifically trained industrial physicians and nurses aid management and its medical staffs in the development of employee health services as well as in the solution of special problems, such as absentee control, labor turnover, aging work force, vision and hearing conservation programs, and health aspects of hazardous working environments.

An effective employee health service is not something that only the large employers can afford. A good program can be designed for as few as 100 employees if the management is really interested and willing to put forth a reasonable effort in undertaking and supporting it.

What is an employee health service, and how does it relate to promoting the health of the worker? Every company is aware of the importance of proper selection, placement, and maintenance of machines and materials to the success of its business. Management also knows that were it not for the working men and women, production schedules would never be met. A company may not have considered whether employees are suited to the jobs they are trying to perform or whether the company is getting a whole or half employee for the wages it pays. The employee health service should help firms make the most effective use of employees' abilities and skills through

proper selective placement and followup health maintenance.

What the workers learn from the plant health service also filters back into their homes. The employer reaps the benefits of a healthier, happier, more productive employee, backed up at home by a healthy family. Such a family is inclined to tell friends and neighbors of the company's interest in them as people; this in turn attracts desirable new employees to the plant or business.

The preplacement examination is performed before the employee is assigned to a job. The plant physician can advise management of the abilities and capacities of the individual so that he can be placed where he can work effectively without jeopardizing his own or his fellow workers' health or safety. Then, just as it plans the maintenance of machines, the company should arrange for periodic health examinations of employees, preferably on a voluntary basis. Those who are working in a hazardous area or with toxic materials, or whose work involves the safety of others, such as operators of moving equipment and food handlers, should have regular, compulsory examinations.

The examining physician should discuss his findings with each employee and counsel him on ways he can preserve or improve his health. The physician may discover diseases or abnormal conditions that will require referral to the family physician or to an appropriate community agency for diagnosis and treatment.

Most importantly, periodic physical examinations afford the best opportunity for early discovery and treatment of diseases and impairments. Examination findings should be

Dr. McCahan is medical director of the Loss Prevention Medical Service of Liberty Mutual Insurance Co.

among their employees. Some even arrange medical examinations for employees and prospective employees. However, if the majority of the country's work force is to be provided with protective health service of the sort that employees of larger concerns enjoy, it will have to be largely at the hands of physicians in private practice in the community.

It behooves the medical profession, therefore, to encourage arrangements whereby physicians in private practice can provide occupational health service to all employee groups in their community, and to do so in a manner that is satisfactory to all groups concerned. The medical profession should make it possible for physicians in private practice to promote occupational health without risking ostracism by their colleagues.

To protect its enterprising members, the medical society must draw up and promulgate guides on the practice of occupational medicine, full time, part time, or on call, patterned on applicable pronouncements by the American Medical Association, and administered fairly and consistently. Among these the most important are statements prepared by the Council on Industrial Health, particularly that on the scope, objectives, and functions of occupational

health programs, published in the *Journal of the American Medical Association* (July 6, 1957, pp. 1104-1106).

Harmonious, cooperative, and effective relations between the plant physician and the private practitioner must be maintained because both are essentially interested in the health of the worker—the plant physician in his capacity as guardian of his health on the job and the private practitioner as his family physician. The genuineness and the effectiveness of their cooperation could have an important, if not critical, bearing upon the health of the worker. Each would derive improvement in his skill and capabilities, as well as peace of mind and satisfaction, from maintaining the closest possible cooperation and communication with the other.

In summary, the best occupational health services possible should be provided to as many of the country's working population as possible. This goal can be achieved only if a far greater number of private physicians serve industry, part time or on call. This requires, and should make for, the closest cooperation and understanding among all physicians in their professional capacity as well as in their capacity as members of the medical society.

Limited Use of BCG Vaccine Recommended

Use of BCG tuberculosis vaccine should be restricted to groups unduly exposed to tuberculosis and without other adequate means of control, according to recommendations of the Ad Hoc Advisory Committee on BCG of the Public Health Service.

The committee cited a number of reasons why large-scale BCG vaccination programs would be inadvisable. It pointed out that the effectiveness of BCG ranges from 0 to 80 percent. BCG offers no protection to persons who are already infected and are most likely to develop active tuberculosis. Widespread use, moreover, would cancel out permanently the effectiveness of the tuberculin test, by which it can be determined whether or not a person is infected with the disease. Since BCG causes all persons who have been vaccinated to react to the tuberculin test, its wide-

spread use would eliminate one of the important diagnostic means of discovering tuberculosis.

For these reasons, the committee recommended that the vaccine be restricted to such special groups as physicians and other medical personnel working in hospitals having inadequate tuberculosis control programs, families in which a member with tuberculosis must remain in the home, and persons associated with institutions in which exposure is known to be high, as in certain mental hospitals and prisons.

The committee was composed of Dr. Rene Dubos, Dr. Herman E. Hilleboe, Dr. Horace L. Hodes, Dr. Esmond R. Long, Dr. Walsh McDermott, Dr. Gardiner Middlebrook, Dr. Rufus F. Payne, Dr. James E. Perkins, Dr. Leon H. Schmidt, and Dr. Jacob Yerushahmy.

Occupational Health Information Exchange

DOHRMAN H. BYERS, M.S.

RAPID advances and developments in modern industry and agriculture have made it very difficult to keep abreast of changes and their associated health hazards. Every year new materials, new processes, and new stresses are introduced into the working environment in tremendous numbers. Each of these represents a potential occupational health problem until evaluated by experience or study. The usual public health data, such as morbidity and mortality figures, do not contribute greatly to the detection or evaluation of such occupational diseases.

This situation has resulted in a growing need for the systematic collection and dissemination of occupational health information by a centralized facility with the cooperation of public health agencies, medicine, industry, labor, academic and research institutions, and all others having interest and responsibility in the prevention of occupational disease.

The Occupational Health Program of the Public Health Service has recognized the need and moved to meet it by establishing the Occupational Health Information Exchange as a distinct and recognized activity within the program. The exchange is operating as part of the Occupational Health Field Headquarters in Cincinnati, Ohio. The establishment of this exchange represents the organization and intensification of an activity carried out to some extent in the past by staff correspondence and consultation. The specialized experience and knowledge of the staff will be an integral part of the new exchange, supplementing and evaluating the information services.

The Occupational Health Information Exchange will serve as a central agency for the collection, collation, and dissemination of all

types of information pertinent to occupational health problems. Most of the information to be assembled will fall into three broad groupings:

1. Information on the detection, evaluation, and control of health problems of the worker will include data from industrial experience; case histories of new or unusual occurrences, exposures, or illnesses; results of research and investigation; and morbidity and mortality figures on occupational diseases. Acquiring information on problems arising from new materials, operations, or conditions in the working environment will be emphasized.

2. Information on technological developments and trends will include data on the identity and nature of new materials, processes, and industries as well as basic figures on employment, production, and consumption of products.

3. An inventory of research and service facilities active in any field of occupational health will be kept current with obtainable information regarding personnel, projects, and programs.

Acquiring Data

While recourse to the technical literature is intrinsic to such an information service, the primary purpose of the exchange is to acquire, evaluate, and provide unpublished or otherwise unavailable data insofar as is possible. A large, relatively untapped reservoir of unpublished, uncoordinated, or fragmentary data accumulates in day-to-day experience in industry and

Mr. Byers is a scientist director in the Occupational Health Program, Public Health Service, Cincinnati, Ohio.

handled in a confidential manner so that the industrial physician becomes the employee's health counselor and can assist the family physician in following up the continuing health maintenance of each worker.

All nonoccupational illnesses and injuries should be promptly referred to the family physician if more than first aid or emergency care is required. Occupational injuries and illnesses are quite properly cared for by the industrial physician within the limitations placed upon him by the workmen's compensation laws and regulations that apply in particular areas.

Despite all attempts to help people keep well, there will always be some who will become ill or injured. The medical staff should maintain an emergency service to which all employees can turn for emergency relief and advice on all illnesses and injuries that occur or are identified by employees while on the job.

Through the maintenance of adequate records and statistics, the industrial physician and

nurse can determine whether a program is meeting employee needs. They can give positive direction for necessary changes and modifications. These data also assist the medical staff in designing a health education program specifically to meet their needs—one based on the problems that are causing disabilities.

Through health counseling and health education, the physician and nurse in industry have the opportunity to make a significant contribution to employee efficiency. When an employee comes to them for advice and guidance because he doesn't feel well, or he has a sick wife or a child who is a behavior problem, or he thinks his supervisor is riding him, or because he thinks his present job is too much for him, the company is reaping some of the real benefits from the employee health service. A good employee can be saved from becoming less than 100 percent effective on his job. Eventually he may be saved from becoming an absentee or total casualty for varying periods of time.

Census of Industrial Nurses

The 1957 census of industrial nurses shows 16,223 are working full time in industry in 45 States, the District of Columbia, Hawaii, and Puerto Rico. This number, as of January 1, 1957, is an increase of 5,127 professional, registered, industrial nurses over the 1952 census total of 11,096.

Questionnaires sent to State and Territorial health departments and the New York and Massachusetts State departments of labor supplied the information for the census.

California, Illinois, Michigan, New York, Ohio, and Pennsylvania each have more than 1,000 nurses employed full time in industry. These six States account for 54.7 percent of the reported total number of industrial nurses. North Dakota, New Mexico, and Alaska reported no industrial nurses.

The census queried nurses about the size of the plants in which they are employed, the type of medical direction they receive, their professional education, and their industrial nursing experience. Census information given below is

based on the number of nurses who replied specifically to these queries.

| | Percent of 7,750 reporting |
|------------------------------|-------------------------------|
| <i>Size of plant</i> | |
| Less than 500 employees..... | 18.6 |
| 500-1,000 employees..... | 22.8 |
| 1,000 or more employees..... | 58.6 |

| | Percent of 7,541 reporting |
|--------------------------|-------------------------------|
| <i>Medical direction</i> | |
| Full time..... | 35.7 |
| Part time..... | 36.9 |
| On call..... | 21.7 |
| Other types..... | 5.7 |

| | Percent of 6,986 reporting |
|---|-------------------------------|
| <i>Professional education</i> | |
| Preparation in occupational health or public health nursing..... | 23.7 |
| Other special fields..... | 11.1 |
| Basic nursing only..... | 65.2 |

Copies of the Census of Industrial Nurses as of January 1, 1957, by Mabelle J. Markee and Elizabeth G. Sullivan, are available from the Occupational Health Program of the Public Health Service.

Employee Health Benefit Programs

LOUIS S. REED, Ph.D.

Two major developments in recent years have had a significant effect on the health status of millions of American workers. One has been the shifting emphasis of implant health programs from care of work injuries to concern for the general health of the worker. Through diagnostic and preventive services, these programs are contributing more and more to health conservation and maintenance. The second development, more widespread and far-reaching, has been the phenomenal growth of employee health benefit plans providing, or paying the cost of, medical care. These two types of programs can and do stand alone. But where both exist, they are more effective, each drawing strength from the other.

A VITAL component of the benefit programs for workers in private industry which have mushroomed in the United States during the last 15 or 20 years are employee health benefit plans, designed to provide health insurance or health services to workers and their dependents. At present, health insurance programs made available and paid for through the worker's place of employment cover more than 35 million employees and their 54 million

dependents, a total of 89 million people. Under such plans, about 68 percent of all nonagricultural employees are protected against the cost of certain health services or have the services themselves made available to them. The growth since 1935 in the number of employees and dependents covered for hospitalization, surgical, and medical benefits under employee health benefit plans is shown in table 1.

Before the early 1930's, employee health benefit programs consisted largely of plans developed by a few employers, frequently those in isolated areas, for the direct provision of health services. Most of these plans were in the mining, railroad, lumber, and textile industries. Employee health benefit plans as we now know them began to evolve in the midthirties when hospital and medical service plans, precursors of today's Blue Cross and Blue Shield, were formed, and insurance companies began writing group hospital, surgical, and medical insurance.

The rapid development of employee benefit programs since 1940 is the result of several factors. Among them are (a) high corporation taxes during and since World War II, (b) various court decisions holding that welfare and pension programs are "bargainable" issues, (c) wage stabilization programs during World War II and the Korean conflict, which tended to keep wage rates down but permitted increases in fringe benefits, and (d) the movement of labor unions to incorporate welfare and pension benefits in their wage policy.

Since 1948 health benefits, along with life and disability insurance benefits, have come to be important elements in collective bargaining agreements. Only a half million workers were covered for health or life and disability

Dr. Reed, associate professor of medical economics, Sloun Institute of Hospital Administration, Cornell University, Ithaca, N. Y., has been in the field of health economics and prepayment plans for more than 25 years. Early in his career he was on the staff of the Committee on the Costs of Medical Care, a pioneer organization in the study of the social and economic aspects of medical care. Prior to his present position he was with the Occupational Health Program, Division of Special Health Services, Public Health Service.

in occupational health research and service activities. Much of this material is not published because it does not seem sufficient to merit publication. Often limitations of time and personnel or other causes prevent publication.

By bringing together and collating such piecemeal information from a variety of sources, it will be possible to recognize or predict answers to many questions concerning occupational exposures and diseases. The correlation of data on exposures of humans under actual working conditions with results of toxicological studies on animals will be facilitated. Better information on the occurrence, nature, and prevalence of new occupational diseases and on the effectiveness of control measures should result.

Summation of data on trends in occupational exposures and inventorying of resources should contribute greatly to better utilization of both governmental and private industrial health facilities and professional skills. Through a better understanding of the potential and relative importance of problems, available resources could be focused on the most significant problems. A centralized inventory of research and service programs can provide a degree of voluntary coordination of the programs, expediting many activities and avoiding duplication of efforts. Areas in need of investigation could be called to the attention of organizations with the facilities and interests to deal with them. Inquiries could be channeled to the most authoritative sources.

Information Sought

To gather the necessary information for accomplishing our objectives, we must have the

assistance and cooperation of many sources. Industry, labor, the medical profession, governmental agencies, academic institutions, research foundations, consulting laboratories, insurance companies, allied information services, and a multitude of others are called upon to contribute information as they are able. No fixed form or pattern for the submission of data is contemplated now. Suitable forms and procedures may be worked out with any group able to supply material on a routine basis. The system must remain flexible enough to accommodate all sources, whether they are individuals or institutions. The ultimate success of the information exchange will depend to a great extent on voluntary and unsolicited contributions of information.

Information will be disseminated by publications and direct letter replies to inquiries. We anticipate that material will be given out mostly by correspondence in response to specific requests for some time, until files and staff can be built up to the point where new, pertinent publications are possible. We do not now plan to have any periodical bulletins, but will publish information at suitable times. Although the Occupational Health Information Exchange is still in the formative stages, we have considerable data in the consulting files and the staff experience of the Occupational Health Program is available. Already we have received contributions for our files and have answered a number of inquiries. We are confident that most persons interested in occupational health or public health will give us items of information as well as an opportunity to serve them.

provide such benefits. Again only a small proportion are covered under independent or self-insured programs. For medical benefits about 54 million persons are covered, the great majority under programs which provide only in-hospital medical service. Probably not more than 9 million persons have coverage for physician service in the office and home as well as in the hospital.

About 6.9 million workers and their dependents are also covered under group major medi-

cal expense policies, which supplement regular hospitalization, surgical, and medical coverages, and another 1.4 million are covered under comprehensive medical expense insurance policies.

Amounts and Sources of Contributions

Contributions, or expenditures, for employee health benefit plans in 1956 totaled, it is estimated, approximately \$2.5 billion (table 3.) Precise data are not available on the portion of the contributions paid by employees and the portion paid by employers. The figures given in table 3 are only rough approximations based mainly on estimates by a number of insurance company and Blue Cross executives as to the prevailing division in their programs. Of the contributions for all plans it is roughly estimated that about two-fifths represent employer and three-fifths employee contributions.

There is a decided trend toward increased financial participation by employers in health insurance plans for their employees. Employers frequently pay the total cost of the program for both employees and their dependents. Also common are arrangements under which the employer pays a part or all of the cost for the employee, who in turn pays the cost for his dependents. Under most collectively bargained plans the employer pays from one-half to all of the cost. Welfare funds are almost universally financed wholly by employer contributions.

Employers' contributions arranged through collective bargaining agreements are generally regarded by the workers as part of their compensation. Even under programs not collectively bargained, there is a tendency for employees to consider fringe benefits as part of their pay.

The tax situation is a contributing factor toward encouragement of employers to assume the costs. An employer's payments for benefit programs are a business expense, deductible from the concern's gross income. An employee's payments come out of personal income subject to income taxes. An employer's dollar buys a dollar's worth of benefits, but it takes more than a dollar of an employee's income to buy a dollar's worth of benefits.

Table 3. Contributions under employee health benefit plans, 1956

[Millions of dollars]

| Type of benefit and carrier | Total | Employer | Employee |
|--|------------------|----------|----------|
| Hospitalization: | | | |
| Blue Cross and Blue Shield plans..... | \$812 | \$244 | \$568 |
| Insurance companies..... | ¹ 690 | 345 | 345 |
| Other ² | 79 | 39 | 40 |
| Surgical-medical: | | | |
| Blue Shield and Blue Cross plans..... | 353 | 106 | 247 |
| Insurance companies..... | ¹ 436 | 218 | 218 |
| Other ² | 83 | 58 | 25 |
| Major medical expense (insurance companies).... | ¹ 52 | 26 | 26 |
| Comprehensive medical expense (insurance companies)..... | ¹ 42 | 21 | 21 |
| Total..... | \$2, 547 | \$1, 057 | \$1, 490 |

¹ Premiums after deduction of dividends.

² Independent prepayment plans and self-insured programs.

SOURCE: In "Total" column, data for Blue Cross and Blue Shield plans are total subscription income as reported by the central organizations of these plans to the Social Security Administration, adjusted to show only income from employee-employer groups; data for life insurance companies are total net premiums as reported from the 1956 survey of group insurance by the Life Insurance Association of America, adjusted for deduction of dividends; data for "other" plans are from the 1956 survey by the Health Insurance Council.

It is estimated that employee contributions represent 30 percent of total Blue Cross and Blue Shield group premiums, 50 percent of total insurance company premiums after dividends, and 70 percent of income of "other" plans. These approximations are based mainly on estimates from the executives of a few large Blue Cross plans and insurance companies as to the relative proportions of employer and employee contributions, on knowledge of the situation in some of the large independent plans and self-insured programs, and on the general showing of a few surveys of group insurance programs which indicate prevailing cost-sharing arrangements.

Table 1. Employees and dependents covered under employee health benefit plans

[Millions of persons]

| End of year | Hospitalization | Surgical benefits | Medical benefits ¹ |
|-------------|-----------------|-------------------|-------------------------------|
| 1935----- | 2.0 | 1.8 | 1.8 |
| 1940----- | 9.5 | 3.5 | 2.0 |
| 1945----- | 24.8 | 9.3 | 3.2 |
| 1950----- | 54.5 | 38.6 | 16.8 |
| 1955----- | 81.6 | 73.4 | 40.8 |
| 1956----- | 89.3 | 82.0 | 54.3 |

¹ Mainly restricted to care in the hospital.

SOURCE: Estimates based on the annual surveys of the Health Insurance Council on the extent of voluntary health insurance in the United States, the annual surveys of group insurance by the Life Insurance Association of America, annual Blue Cross and Blue Shield enrollment reports, and publications of the Social Security Administration on extent of coverage under independent prepayment plans.

insurance benefits under such agreements in 1945. By 1950 about 7 million workers were so covered, and in early 1954, more than 11 million.

Types of Health Benefits and Carriers

Table 2 shows the number of employees and their dependents covered under health benefit plans for various health services, by type of carrier. At the end of 1956 approximately 35.4 million employees were covered for hospitalization through plans made available and paid for through the workplace. With their dependents a total of 89.3 million people, more than half of the population, were so covered. The latest figures of the Health Insurance Council show that, after allowance for duplicating coverages, approximately 116 million persons in the United States have some type of hospitalization coverage. The difference between these two figures represents people covered by individual (nongroup) insurance and those covered through rural and similar non-employer-employee groups.

More than 94 percent of the persons covered by employee health benefit plans for hospitalization benefits are insured, in roughly equal proportions, through Blue Cross plans and the few Blue Shield plans that offer hospitalization benefits or through group policies of insurance companies. The remaining 6 percent, 2.1 mil-

lion employees and their dependents, are served through other types of plans. These last include the so-called independent prepayment plans under community, cooperative, or private medical group auspices, such as the Kaiser Health Plan, the Group Health Association, and the Ross-Loos Medical Group, and management- and union-sponsored self-insured programs such as the United Mine Workers medical program. The self-insured plans provide health services or benefits directly rather than through the purchase of insurance or prepayment coverage.

For surgical benefits approximately 82 million workers and dependents are covered, more through insurance companies than through Blue Shield and the few Blue Cross plans that

Table 2. Employees and dependents covered under employee health benefit plans, by type of benefit and carrier, end of 1956

[Millions of persons]

| Type of benefit and carrier | Employees | Dependents | Total |
|--|-----------|------------|-------|
| Hospitalization----- | 35.4 | 53.9 | 89.3 |
| Blue Cross and Blue Shield plans----- | 16.6 | 24.9 | 41.5 |
| Insurance companies----- | 16.7 | 27.0 | 43.7 |
| Other ¹ ----- | 2.1 | 2.0 | 4.1 |
| Surgical----- | 32.9 | 49.1 | 82.0 |
| Blue Shield and Blue Cross plans----- | 13.3 | 19.9 | 33.2 |
| Insurance companies----- | 17.4 | 27.0 | 44.4 |
| Other ¹ ----- | 2.2 | 2.2 | 4.4 |
| Medical----- | 22.3 | 32.0 | 54.3 |
| Blue Shield and Blue Cross plans----- | 10.6 | 15.9 | 26.5 |
| Insurance companies----- | 9.6 | 14.1 | 23.7 |
| Other ¹ ----- | 2.1 | 2.0 | 4.1 |
| Major medical expense ² ----- | 3.1 | 3.8 | 6.9 |
| Comprehensive medical expense ² ----- | .5 | .9 | 1.4 |

¹ Independent prepayment plans and self-insured programs.

² Insurance companies only.

SOURCE: For Blue Cross and Blue Shield, the 1956 survey of the Health Insurance Council (reference 1), the data being adjusted to show employer-employee group enrollment only; for insurance companies, the 1956 survey of group insurance by the Life Insurance Association of America (Group Insurance and Group Annuity—Continental United States Business—1956); for the "other" plans, the Health Insurance Council's report with adjustments to show employer-employee group enrollment only.

provide such benefits. Again only a small proportion are covered under independent or self-insured programs. For medical benefits about 54 million persons are covered, the great majority under programs which provide only in-hospital medical service. Probably not more than 9 million persons have coverage for physician service in the office and home as well as in the hospital.

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There is a decided trend toward increased financial participation by employers in health insurance plans for their employees. Employers frequently pay the total cost of the program for both employees and their dependents. Also common are arrangements under which the employer pays a part or all of the cost for the employee, who in turn pays the cost for his dependents. Under most collectively bargained plans the employer pays from one-half to all of the cost. Welfare funds are almost universally financed wholly by employer contributions.

Employers' contributions arranged through collective bargaining agreements are generally regarded by the workers as part of their compensation. Even under programs not collectively bargained, there is a tendency for employees to consider fringe benefits as part of their pay.

The tax situation is a contributing factor toward encouragement of employers to assume the costs. An employer's payments for benefit programs are a business expense, deductible from the concern's gross income. An employee's payments come out of personal income subject to income taxes. An employer's dollar buys a dollar's worth of benefits, but it takes more than a dollar of an employee's income to buy a dollar's worth of benefits.

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It is estimated that employee contributions represent 30 percent of total Blue Cross and Blue Shield group premiums, 50 percent of total insurance company premiums after dividends, and 70 percent of income of "other" plans. These approximations are based mainly on estimates from the executives of a few large Blue Cross plans and insurance companies as to the relative proportions of employer and employee contributions, on knowledge of the situation in some of the large independent plans and self-insured programs, and on the general showing of a few surveys of group insurance programs which indicate prevailing cost-sharing arrangements.

Administrative Arrangements

Employee benefit plans are set up and administered in two ways: by the employer alone or by the employer and the union as part of a welfare fund. Under the first arrangement the employer makes a certain program of insurance benefits available to his employees, paying either the whole cost or that portion over and above specified employee contributions. Where there is no union, the employer decides on the program, chooses the insurance carrier or plan through which benefits will be made available, maintains the contacts with the carrier, and deducts the employees' contributions, if any, from their pay. Where there is a union, the union and the employer together choose the program, determine the level of benefits, and sometimes select the insurance carrier.

Under a welfare fund arrangement, a single employer, or much more commonly many employers, and a union have agreed upon establishment of the fund into which the employer makes specified contributions, usually a certain number of cents per employee-hour worked or a certain percentage of wages paid to workers covered under the agreement. Such funds must be set up in accordance with requirements in the Labor-Management Relations Act of 1947. They must be managed by trustees representing in equal numbers the union and the employer (or employers) with an arrangement for breaking ties in the event of a deadlock. There must be a written agreement stipulating the basis of the employer's contribution, an annual audit of the finances, and separation of money for welfare benefits from that for pension benefits.

Typically, a jointly managed welfare fund results from an areawide or regionwide agreement between a union and all employers of members of that union in the area. Once the fund has been established, its trustees agree on a program of benefits and the vehicle through which the benefits are to be provided.

It has been estimated that of all employees under welfare plans, 92 percent are under employer-administered plans, 7 percent under funds managed jointly by several employers and a union, $\frac{1}{2}$ of 1 percent under funds man-

aged jointly by a single employer and a union, and $\frac{1}{2}$ of 1 percent under wholly union-administered (no employer contributions) plans.

Trends and Issues

A salient feature of employee health benefit plans is their diversity. Benefits range from meager to fairly comprehensive. The plans are written by perhaps 250 prepayment organizations and 100 or more insurance companies, all with diverse offerings, some with permutations of contracts or policies ranging into the hundreds, and many willing to write virtually any contract requested by an employer, an employee group, or a union.

A major trend has been toward more comprehensive coverage of health services. Prepayment plans and insurance companies, 20 years ago, first offered only hospitalization benefits, and these were limited to 21 or 30 days and were restricted to employees. The contracts were quickly expanded to include dependents. Progressively, they were extended to include surgical and in-hospital medical benefits. Hospital benefits were broadened until today some Blue Cross plans and insurance companies will provide complete care for 365 days or longer. There has also been some coverage of physician calls in the office and home, and of X-ray and laboratory services outside the hospital.

Within the last few years there has been a wide sale by insurance companies of major medical expense policies, supplementing the basic hospitalization, surgical, and in some instances medical coverages. These policies typically pay 75 or 80 percent of all medical expense in any illness over and above the benefits provided by the basic policy and a "deductible" of a given amount which the employee must pay himself. More recently, there has been considerable growth of comprehensive medical expense policies, which in effect combine the basic and major medical coverages in a single package. These plans meet 75 or 80 percent of medical expenses in any illness or year over and above an initial deductible amount. The Blue Cross and Blue Shield plans to some extent have developed analogous coverages or have ex-

tended their basic programs to offer more comprehensive coverage.

These developments indicate an awareness on the part of the public of the need for and desirability of prepayment coverage which will provide all-inclusive protection against the cost of serious illness. While further impressive advances in the growth of health insurance may be expected, there are no settled views in this country as to the nature and scope of such programs. Certain fundamental questions must now be faced: How far should health insurance go in providing a completely comprehensive health service? Should it cover physician service in the office and home, nursing care, dental care, drugs, eye care? Should it provide periodic health examinations and preventive services? What is the basic objective of these programs? Is it to provide protection against the risk of heavy medical costs? Is it to make available to people on a convenient budgeting basis all services necessary to prevent illness, maintain health, and care for disease and injury? These initial questions are central to the underlying philosophy of health insurance plans.

Other equally fundamental questions concern the administration and operation of such plans. For example, is it desirable that insurance should provide or make available specified health services, with the insured having no direct payments or charges to pay, or should it be content to pay a major portion of the costs? Are "deductibles" and "co-insurance" necessary to keep utilization of health services within reasonable limits, or can this goal be best achieved by other means? By what means can the costs of hospital and medical services best be held to reasonable levels? Is medical service best and most economically provided through individual practitioners selected by the patient and paid on a fee-for-service basis, or through organized medical groups where physicians

work as a team? Does insurance have no concern or every concern with the quality and adequacy of care received by patients?

As yet not even the beginnings of agreement on the answers to these and other questions are apparent.

In this situation employee health benefit plans are playing an important role. These plans marshal the consumers of medical care into cohesive and vocal groups. An employer with tens of thousands of workers and an outlay for health insurance of several million dollars a year has a strong interest in the answer to the questions posed. So does a labor union with hundreds of thousands of members which is bargaining for and shaping a health benefit plan.

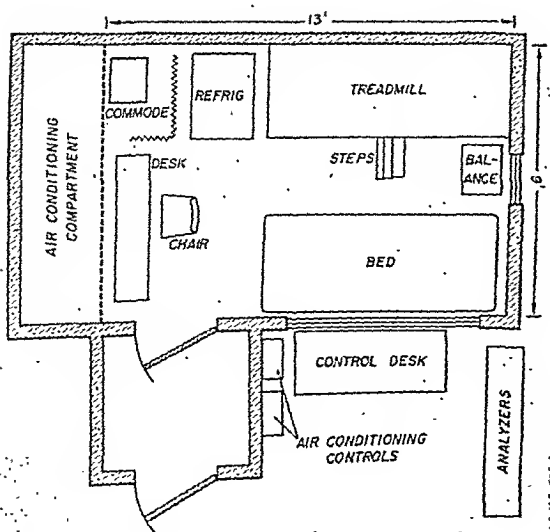
Employee health benefit programs are a dynamic factor in the development of health insurance. Large employers and unions are continuing to seek experimental health insurance policies or contracts with broadened coverage and scope of benefits. In some instances, where they find they cannot purchase the broad insurance coverage that they want, they are developing their own self-administered program. In the future, the influence of employee health benefit plans may be expected to extend beyond the worker groups which they cover directly. They may well contribute to the evolution of health insurance plans which will provide more comprehensive benefits to the rest of the population as well. In this way they could help raise the level of protection against the costs of medical care for the Nation as a whole.

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Metabolic Chamber



Long interest in the effects of activity and disease on human energy has led to the construction of a sealed chamber large enough to allow patients to carry on varied ambulatory activity during metabolic tests. At the National Institute of Arthritis and Metabolic Diseases, Public Health Service, where the project was developed, the person under test lives a relatively normal life for several days in the precisely controlled climate of the chamber, which is attached to a battery of recording and analyzing instruments. Physicians and scientists are thus able to discern new facts on the intimate process of human use of food for the building of tissues or for conversion to useful energy.

continued on p. 1086

Flanking the double-doored entrance to the chamber (opposite page) are intricate analyzing and recording instruments, on the right, a control panel facing the picture window, and an electrocardiograph, lower center. A unique feature is the plastic helmet worn by test patients (right). Suction draws expired air through a plastic tube to electronic instruments. Fresh air enters under vinyl plastic apron, passes within the hood and around the subject's head. Through the "elephant's trunk," he may scratch his nose, shave, wash, and take liquids through a straw. In the chamber (below) he reads, works at the desk, or walks on the treadmill for exercise. The window shown here overlooks the countryside. Also in the room are a picture window facing the control room, a refrigerator, commode, and scale. The subject converses through a combined speaker and microphone in the helmet, part of a two-way communication system.



Over the years, scientific investigators have accumulated much information on the basal rate of metabolism of man in the resting state and some data on isolated aspects of metabolism for short periods of activity. Now, for the first time, they are able to obtain readings on the metabolism of man active for sustained periods of time.

A system of continuous collection of expired air coupled with the use of continuously recording stream gas analyzers indicate minute-to-minute patterns of variation in oxygen-carbon dioxide exchange. This feature permits close analysis of the characteristics of gas exchange in studies of the expenditure of exercise energy and of work efficiency. Also measured are changes in expired air gas concentrations over many hours or days, contributing to the study of the influence on total energy metabolism of a variety of environmental, hormonal, nutritional, and other factors.

The metabolic chamber is about 9 by 13 feet with an 8-foot ceiling. It is an open circuit, indirect calorimeter, conditioned for close control of temperatures ranging from 5° to 49° C. and relative humidities of 10 to 95 percent over most of the temperatures. Air recirculates through the chamber at a rate of 1,300 cubic feet per minute but air velocity is low, less than 50 feet per minute, attained through inlet ports over the entire ceiling and a large exhaust area over half of one wall.

Air flowing into a collection hood over the subject's head and shoulders is carried outside the chamber by a flexible tubing reinforced by

steel spring wire along a main line through an air volume meter to a vacuum line. The flow rate is close to 100 liters per minute, about 10 times the volume an individual breathes in and out each minute while resting. Separate vacuum and pump systems pull air from the main line at constant rates of 50 and 100 cc. per minute. Periodically valves are switched so that analyzers tap fresh air directly from the chamber for reference or baseline. Before and after each test, the gas analyzers are calibrated by flowing into the empty hood known constant flow volumes of carbon dioxide from a calibrated spirometer. This volume mixes with the main flow of fresh air, supplying a known addition of CO₂ and a known reduction in oxygen concentration.

Data on relative humidity, oxygen, and carbon dioxide from the analyzers are fed to the multiple point Speedomax continuous recorder. Between events in the chamber and their record, there is a time lag of about 2 minutes, representing time required for air to flow to the analyzers and for the analyzers to state the concentrations faithfully. The project, according to scientists at the institute, is directed toward establishing a technique of total energy balance which may provide answers to fundamental physiological questions of energy metabolism.

The chamber was developed in the institute by Drs. G. Donald Whedon, chief, Metabolic Diseases Branch, and Russell M. Wilder, former director of the institute, now retired. They were assisted by Ernest E. Huber, Jr., a physicist, and Ronald H. Thompson, a physiologist.

Weekly Reports on Acute Respiratory Diseases

From information gathered during household interviews, the National Health Survey of the Public Health Service is issuing a series of weekly reports on the prevalence and incidence of acute respiratory diseases severe enough to cause bed disability.

Including figures for influenza, pneumonia, and similar conditions, the reports estimate the number of cases in continental United States during each week since mid-July 1957, and the average number of persons in bed each day as a result of the diseases.

Estimates for the most recent week are provisional.

The first report, issued November 7, covered estimates through the week ending October 12 and included a description of methods used in compiling data, definitions of the disease group and of indexes, and a statement on the reliability of the data.

The weekly reports, *Current Statistics on Respiratory Diseases*, may be obtained from the National Health Survey, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

Dieldrin Poisoning in Man

WAYLAND J. HAYES, Jr., M.D., Ph.D.

In certain programs, 10-20 percent of spraymen applying dieldrin for the control of disease vectors have been poisoned. Half or more of the reported cases were characterized by epileptiform convulsions. In general, the occurrence of poisoning parallels the intensity and duration of exposure but the factors influencing safety are too little understood. Ordinary, careful medical examination may offer the most sensitive and practical way of detecting preclinical poisoning, thus removing workers from exposure to prevent serious illness.

THERE IS NO DOUBT about the value of dieldrin in the control or even eradication of certain vectorborne diseases. Unfortunately, its use under certain conditions has led to poisoning of some of the workers who received extensive daily exposure for long periods. Information on the epidemiology and clinical course as well as the more recently described preclinical signs of this poisoning is bound to be of interest to those who use dieldrin or contemplate its use in control programs. This review was written because information on dieldrin poisoning has not been publicized widely.

Dr. Hayes is chief of the Toxicology Section, Technical Development Laboratories, Communicable Disease Center, Public Health Service, Savannah, Ga. He submitted this report to the Pan American Sanitary Bureau in his capacity as technical consultant to the bureau at the Symposium on Toxicological Investigations of Dieldrin held in Maracay, Venezuela, on May 15-16, 1957. The symposium was sponsored by the division of malariology of the Venezuelan Ministry of Public Health and Social Welfare.

The Spanish version of this paper is being published in the December 1957 issue of the *Boletín de la Oficina Sanitaria Panamericana*.

If it were possible, it would be desirable to state the conditions which have led to poisoning in one place and those which have permitted the safe use of dieldrin in another locality. Differences in spray practices and in the personal habits of workers are obvious but not very enlightening. It is easy to find examples of "carelessness" in the groups in which cases of poisoning have occurred, but the same is true among workers who have remained well. Dieldrin has been used under strict supervision in some programs and with little supervision in other programs without producing poisoning. The number of workers involved or the amount of dieldrin really used by individual workers in these programs is frequently so small and the duration of use is so short that no useful information can be gained about the safe use of the compound in a large, continuing program.

It would seem that many reported cases of poisoning were the expected result of flagrant disregard of precautions suggested by the World Health Organization (1) or other groups. It appears reasonable to conclude that dieldrin should not be used where lack of water or some other factor makes the practice of cleanliness impossible. If the normal standards of hygiene are low, the use of dieldrin

should be considered only if extensive supervision of the labor force can be exercised.

There is a need for time-motion studies of workers and measurements of their respiratory and especially their dermal exposures under different conditions.

Because of the need for dieldrin, any research would be a great contribution if it proved the value of some combination of procedures permitting safer use of the compound under practical conditions. As indicated below, an approach which appears hopeful is that associated with the early detection of preclinical illness.

Illness in Venezuelan spraymen caused by repeated exposure to dieldrin was first mentioned by Carrillo in 1954 (2). Although dieldrin was at first discounted as the cause of sickness, the true relationship was recognized very soon, according to A. Gabaldon (personal communication, 1954). Poisoning similar to that in Venezuela was also observed in Nigeria (3) and in Ecuador, according to information supplied by Lópes da Silva in 1956. In the United States, also, poisoning characterized by convulsions and associated with dieldrin and closely related compounds was observed in industrial workers (4).

Later and more complete studies of clinical poisoning have been reported by Blázquez and Bianchini (5-7). From the work which has been done, the following conclusions seem clear.

Clinical Illness

1. Under practical conditions of work in Venezuela, Ecuador, and Nigeria, clinical poi-

soning has been reported in about 10 to 20 percent of spraymen (table 1).

2. The earliest observed poisoning occurred after a little less than 3 months of exposure. However, in the most comprehensive study available (7), no cases occurred in less than 4 months of exposure, and only 2 percent of the spraymen exposed less than 8 months became sick. In general, the proportion of sprayers poisoned increased with the duration of their work (table 2). Twenty-six percent of workers exposed 8 months or more became sick. In consideration of the inevitable variation in the intensity of exposure of different workers and also the small number of workers studied with exposure greater than 2 years, the available data offer no indication of variation in individual susceptibility to poisoning although this possibility is not ruled out.

3. All of the reported cases were severe enough for the patients to seek medical aid. Half or more of the patients had convulsions. Although investigators have understandably reserved judgment in some individual cases, the epidemiology of the disease leaves no doubt that most, if not all, of the reported cases represent poisoning. In fact, it is most likely that some cases of real poisoning, especially mild ones, have been misdiagnosed and thus not reported.

4. Mild clinical illness caused by dieldrin poisoning is characterized by the following symptoms: headache (which is frequently persistent and not responsive to drugs), blurred vision, dizziness, slight involuntary muscular movements, sweating, difficulty in sleeping and bad dreams, nausea, and general malaise. (It

Table 1. Dieldrin poisoning cases in three countries

| Country | Number of spraymen | Clinical cases | Cases with convulsions | Fatalities | Percent of sprayers poisoned |
|----------------|--------------------|----------------|------------------------|------------|------------------------------|
| Venezuela..... | 285 | 51 | 22 | 0 | 18 |
| Ecuador..... | 92 | 8 | 1 4 | 1 | 9 |
| Nigeria..... | 40 | 2 4 | 2 4 | 0 | 10 |

¹ Possibly underestimated.

² One patient had a history of epilepsy.

NOTE: Venezuela—1.25 percent suspension is applied to porous surfaces and a 2.50 percent emulsion is applied to nonabsorbent surfaces at a rate of 1 gm./m.² in each instance. Ecuador—2.50 percent formulations are used at a rate of 0.5 gm./m.². Nigeria—0.68 percent suspension and emulsion and 1.37 percent suspension are used at rates of 0.27 and 0.54 gm./m.².

Table 2. Relation of poisoning to duration of exposure to dieldrin, Venezuela ¹

| Months of exposure | Number of spraymen with stated months of exposure | Number of spraymen at hazard | Cases of poisoning | |
|--------------------|---|------------------------------|--------------------|----------------------------|
| | | | Number | Percent of those at hazard |
| 0-3.9 | 69 | 285 | 0 | 0 |
| 4-7.9 | 38 | 216 | 5 | 2 |
| 8-11.9 | 26 | 178 | 9 | 5 |
| 12-15.9 | 54 | 152 | 14 | 9 |
| 16-19.9 | 41 | 98 | 13 | 13 |
| 20-23.9 | 45 | 57 | 4 | 7 |
| 24-27.9 | 7 | 12 | 6 | 50 |
| 28-31.9 | 1 | 5 | 0 | 0 |
| 32-35.9 | 0 | 4 | 0 | 0 |
| 36-39.9 | 4 | 4 | 0 | 0 |
| 0-39.9 | 285 | 285 | 51 | 18 |

¹ Modified from Blázquez and Bianchini (7).

is entirely possible that other syndromes exist. The poorly defined illness of the European superintendent described by Haworth (3) may well be a case in point.)

5. More severe illness is characterized by the symptoms already mentioned and also by stronger jerking of entire muscle groups leading to movement of some part of the body or the limbs or even causing the patient to fall. In extreme cases these movements are accompanied by momentary loss of consciousness.

6. The most severe, nonfatal poisoning observed so far has been characterized by one or more epileptic convulsions with loss of consciousness but without involuntary incontinence of feces or urine. One patient had more than 30 convulsions. Because patients are unconscious during seizures it is likely that some seizures have been overlooked.

7. The circumstances associated with the death of a sprayman in Ecuador are not known except that he was exposed to dieldrin and his illness was characterized by convulsions. (Animal experiments have revealed a form of dieldrin poisoning which, in the absence of treatment, is uniformly fatal. It is marked by convulsions, complete food refusal, and rapid loss of weight. Such poisoning would almost certainly occur in man under certain condi-

tions but has apparently not yet been described.)

8. The convulsions and sudden falls associated with severe illness are of brief duration. Aside from these attacks and the wounds they may produce, signs of illness are not prominent even soon after a convulsion. However, by very careful observation, the following signs may be discovered in many cases of clinical poisoning: slight alteration of reflexes, incoordination (Romberg and other tests), nystagmus, tremor, sweating, dermatographia, and muscular fibrillations (which can sometimes be elicited by striking the muscle or, apparently, by hyperventilation). Occasionally, patients exhibit disorientation or change of personality. Tachycardia and arrhythmia are fairly common.

9. Following removal from exposure, all survivors showed initial improvement. However one patient suffered a recurrence of convulsions 84 days after his last exposure to dieldrin. Some other patients have required as much as 105 days for recovery. In view of these facts and the fact that it has been impossible to follow all cases, it is clear that dieldrin poisoning in man tends to be chronic, but the full extent of the chronicity is not yet known.

10. There is a broad relationship between intensity and duration of exposure, sickness, and the amount of dieldrin in the blood as determined by bioassay. However, the bioassay, as it has been used so far (6-8), shows so much individual variation that it is of limited diagnostic value (table 3).

11. Electroencephalograms were abnormal in about half of the clinical cases studied by this method. But the absence of detectable abnormality in many cases, the small degree of abnormality in some other cases, the presence of abnormality in a few unexposed people, and the expense and difficulty of electroencephalography make it of limited value. Detailed information in the tracings has been given by Ducharme (9).

Cases clearly involving the ingestion of single doses of dieldrin have not been reported, but such cases have been published in connection with related compounds. Poisoning by aldrin in combination with a solvent was complicated by effects on the liver and especially on the kid-

should be considered only if extensive supervision of the labor force can be exercised.

There is a need for time-motion studies of workers and measurements of their respiratory and especially their dermal exposures under different conditions.

Because of the need for dieldrin, any research would be a great contribution if it proved the value of some combination of procedures permitting safer use of the compound under practical conditions. As indicated below, an approach which appears hopeful is that associated with the early detection of preclinical illness.

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be successfully analyzed after addition to blood in the laboratory (14). It may be that the difficulty of chemically analyzing dieldrin in the blood of patients lies in the problem of extraction and purification of the sample. Such problems are well known in connection with the analysis of DDT in blood in contrast to the analysis of DDT in fat.

Prevention

Many of the papers mentioned above have ended with a list of recommendations regarding spray practices. The recommendations have generally been reasonable. Many of the authors stated flatly that dieldrin can be used safely in an insect control program if the recommendations are carried out. Perhaps this would be true if the recommendations were followed in practice. However, it is necessary to face the fact that (except by discontinuing the regular use of dieldrin) poisoning has not yet been eliminated in connection with any insect control program which gave rise to dieldrin poisoning in the first place.

The limitations of present knowledge of dieldrin poisoning and failure to eliminate such poisoning must be kept in mind. It is equally important to remember that (although complete proof is not yet available) there is evidence that ordinary, careful medical examination by a physician (especially systems review and neurological examination) offers the most sensitive and most practical way of detecting preclinical poisoning. If preclinical poisoning is detected early and affected workers are removed permanently from dieldrin exposure, it may be possible that clinical poisoning can be prevented to a large extent. Furthermore, past failure does not eliminate the possibility that the protection of spraymen and, especially, the uncompromising education of those workers in personal hygiene will greatly reduce the incidence of dieldrin poisoning.

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neys as well as the nervous system (10, 11). Poisoning of more than 59 persons by endrin eaten as a contaminant of bread involved the gastrointestinal system as well as the nervous system (12). Clinical recovery following a single dose of these compounds has been prompt, although the electroencephalogram did not return to a normal reading for almost 5 months in the aldrin case. Similar results would be expected if dieldrin were eaten.

Preclinical Poisoning

An effort to detect preclinical poisoning has been reported by Winthrop and Felice (13). A total of 109 spraymen (about half of those employed in Venezuela at the time) were examined. Seventy-two of the 109 spraymen had been exposed to dieldrin for an average of 70 weeks and were currently exposed at the time of examination. Twenty-six of the 109 had been exposed for an average of 30 weeks but had had no contact with the compound for at least 10 weeks prior to the date of examination. In addition to the spraymen, 64 men without occupational exposure to dieldrin but otherwise as nearly comparable to the spraymen as possible were examined as controls.

The following symptoms and signs occurred more frequently in spraymen exposed to dieldrin for an average of 30 or more weeks than in controls: headache, blurred vision, diplopia, tinnitus, dizziness, slight involuntary muscular movements, sweating, difficulty in sleeping and bad dreams, nausea, alteration of reflexes, incoordination, nystagmus, muscular fibrillations, and change in personality.

The parallelism of these symptoms and signs and those associated with clinical illness is remarkable and probably not accidental. It is important to remember, however, that the relationship has not been evaluated either by a statistical analysis of the data collected by Winthrop and Felice or by a practical test. A practical test would consist of an effort to prevent all poisoning severe enough to cause a workman to seek medical care. Serious poisoning could be prevented theoretically if workers were removed completely from dieldrin exposure as soon as they reached some critical level of preclinical effect.

Table 3. Bioassay index for various groups of workers in Venezuela¹

| Group | Range | Mean |
|---|--------|------|
| Controls (5)----- | 0 | 0 |
| 7 workers exposed 76 days without clinical illness (5)----- | 0-36 | 16 |
| 9 workers with grade I intoxication (5)----- | 0-90 | 53 |
| 10 workers with grade I intoxication (6)----- | 22-100 | 69 |
| 7 workers with grade III intoxication (5)----- | 0-100 | 71 |
| 16 workers with grade III intoxication (6)----- | 8-100 | 70 |

¹ Recalculated from data of Blázquez and Bianchini (6, 7).

² Occasionally the death from natural causes of insects used in the tests will produce an index greater than zero.

The "symptom profile," the "sign profile," and the resulting "profile index" (13) are devices for expressing results conveniently and they deserve serious consideration. However, these devices do not test the data. To be of use they must be based on careful examination of the patient. The profile index should be used or modified as convenience and experience dictate. Not necessarily related to the use of this index is the suggestion that technicians could be trained to administer systems reviews and even perform simple neurological examinations. Records obtained by technicians could be interpreted by a physician who would examine thoroughly those spraymen showing progressive or sufficiently serious abnormalities.

About one-third of the spraymen who were not sick showed some abnormality in their electroencephalograms (9, 13). It is of interest that abnormality of the brain waves may continue for more than 4 weeks after the last exposure to dieldrin. However, for reasons outlined above, the test is of limited value. The usefulness of spinal fluid examination in the diagnosis of dieldrin poisoning is not established although the findings justify further study in laboratory animals.

Considerable study has failed to show any value of the following tests in connection with dieldrin poisoning: urinalysis, complete blood study, chest X-ray, determination of visual fields, psychometric tests, or chemical determination of dieldrin in the blood. Dieldrin can

be successfully analyzed after addition to blood in the laboratory (14). It may be that the difficulty of chemically analyzing dieldrin in the blood of patients lies in the problem of extraction and purification of the sample. Such problems are well known in connection with the analysis of DDT in blood in contrast to the analysis of DDT in fat.

Prevention

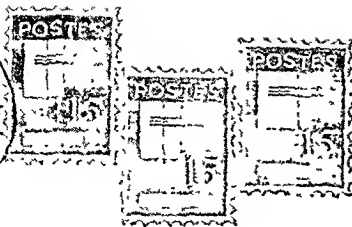
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The limitations of present knowledge of dieldrin poisoning and failure to eliminate such poisoning must be kept in mind. It is equally important to remember that (although complete proof is not yet available) there is evidence that ordinary, careful medical examination by a physician (especially systems review and neurological examination) offers the most sensitive and most practical way of detecting preclinical poisoning. If preclinical poisoning is detected early and affected workers are removed permanently from dieldrin exposure, it may be possible that clinical poisoning can be prevented to a large extent. Furthermore, past failure does not eliminate the possibility that the protection of spraymen and, especially, the uncompromising education of those workers in personal hygiene will greatly reduce the incidence of dieldrin poisoning.

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- (13) Winthrop, G. J., and Felice, J. R.: Un estudio clínico-toxicológico con rociadores de un insecticida de hidrocarburo clorado. Mimeographed report, presented at the Symposium on Toxicological Investigations at the Division of Malariology. Maracay, Venezuela, 1957.
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Baby Show in Mafrak

Ninety healthy infants were contestants and 14 received prizes in the baby show held at the clinic at Mafrak, Jordan. Child care is improving from the clinic's system of teaching mothers in groups. This system reaches more mothers and babies than individual instruction.

—ELIZABETH C. HILBORN, *formerly chief nurse, U. S. Operations Mission, Jordan.*

Fathers and Sons

"It was good enough for my father and it's good enough for me" was the gray-bearded village council members' reply when we tried to get them to install a water distribution system.

In the Iranian village where this happened I spoke especially to the few young men on the council. "It is hard to estimate the value of the life of a young child," I said, "but the cost of a water system does not begin to approach it."

Every one of the young men came up to see me after the meeting. Such a thing was good for them, they realized, but they were few and because of their age, had little to say about the running of their village.

In other villages we visited during our trip through Fars Ostan (province) in southwest Iran, we got many requests for water distribution systems. Though some lacked the money to put in a new system we were able to help them with hand pumps or repairs to the old system. Some villages wanted bathhouses, and we promised to come back and make preliminary sketches for drafts to be approved later.

A few years ago persuading people to change their bathing habits was almost impossible, but with newly developing understanding, old customs are changing. For instance, in one village a local contractor building a bathhouse with a common bath,

voluntarily switched to a shower system after talking with the district's sanitarian aide.

We made the trip to see the sanitarian aides' work, to persuade municipalities to send employees to the Palasht School of Sanitation, and to encourage towns to spend 0.005 percent of their budgets on health and sanitation.

Several times we visited schools and invariably were asked to question the children. The majority knew the answers to questions such as "Is it better to be clean or dirty?" or "What is the cause of malaria?" and "What should be done about it?" The hope of Iran lies in the young.

—DAVID S. REID, *Shiraz provincial sanitary engineering adviser, U. S. Operations Mission, Iran.*

Sergipe's Health Centers

Ten health centers were opened during a tour the Governor of Sergipe, Dr. Henrique Maia Penido, superintendent of Serviço Especial de Saúde Pública, and I made of this state in northeast Brazil. SESP and the Sergipe Health Department signed a contract only a year ago. Sergipe had never before allocated so much money to health.

In the interest of economy, not one of the centers was constructed from the ground up; some half-finished or vacant building or remodeled home was used. All 10, either separately or in pairs, are staffed by full-time doctors, nurses, and home visitors, an innovation for Sergipe.

—E. ROSS JENNEY, M.D., *chief, Division of Health and Sanitation, U. S. Operations Mission, Brazil.*

Vaccination for Chickenpox

People in Liberia find it hard to understand why we don't vaccinate against chickenpox. Their young children are apt to die from chickenpox complications such as pneumonia or superimposed malaria.

Outbreaks of the disease are often reported as smallpox. When we had no word from our dresser in Kokoyah for several months, the reason given was that he had gone on patrol to vaccinate everyone in his chiefdom against smallpox and chickenpox.

—E. L. MASTHOFF, M.D., *medical officer, U. S. Operations Mission, Liberia.*

The Role of the Mental Health Service in the Local Health Department

JULIAN G. HANLON, M.S.W.

DRAMATIC changes in mental health programs have occurred throughout the United States during the last decade. Prior to that time, certain States had made significant progress in coping with their mental health problems, but for the most part, the national picture was marked by scarcity of trained personnel, inadequate programs, and a woeful lack of significant research into causes and treatment of mental disorders.

With the passage of the National Mental Health Act of 1946, the picture began to change. Through the National Institute of Mental Health, Public Health Service, funds became available for training mental health personnel in the various disciplines, and there was also a tremendous increase in the funds which could be made available for important psychiatric and mental health research. Included in this new law were provisions for grants to States which enabled them to initiate community mental health programs. Recent legislation provides for mental health project grants for studies of improved methods in the care and treatment of mental patients, and thus we can look forward to constant improvement in our State mental hospital systems, hitherto an almost neglected area. Running parallel to all this, and to a large degree responsible for these

advances, has been an awakening of interest by the people of this country. Citizens' mental health groups are demanding that even more attention be paid to mental illness and the prevention of such illness wherever possible.

The mental health service in the local health department is assuming increasing importance in our attempt to deal with these serious, unsolved mental health problems. There are two main reasons why the local health department is important in building the mental health of the community. First, and this is somewhat negative, we now recognize that we must look to local health departments and other nonpsychiatric groups because we will never have enough psychiatric personnel to do the job. By other nonpsychiatric groups I mean various community health and welfare organizations which have an interest in people who are in trouble. Despite 10 years of greatly expanded training in psychiatry, clinical psychology, psychiatric social work, psychiatric and mental health nursing, and a large expenditure of funds, we are still woefully lacking an adequate number of workers in this field.

Second, and certainly more significant, is the reservoir of knowledge, experience, and proved methods public health workers can offer to the mental health field. The psychiatric and ancillary professions are improving their skills in individual treatment and stepping up their efforts to find causes and cures for mental disorders, but there is also a recognized need to go beyond this to the building of improved mental health generally. In order to make a dent in this problem, we must devise ways of working

Mr. Hanlon is psychiatric social work consultant with the Public Health Service, Region 3, Charlottesville, Va. The paper was presented in essentially the same form at the 25th annual meeting of the Southern Branch, American Public Health Association, Asheville, N. C., May 30, 1957.

effectively with large groups of people. We must think in terms of early case finding and prevention. Is this not the area in which public health workers have labored so long and in which they have achieved such success?

Thus, a local health department has the same responsibility for the mental health of a given community as it does for the community's physical health. The department may of necessity approach the mental health problems of the community in a slightly different way. There may be even greater reliance on other community agencies in carrying out the work. In some communities another agency may have primary responsibility for the mental health program. Nevertheless, the local health department will always be a factor, and a potent one, in the community's efforts to grapple with the mental health problems of its population.

Without laying out a blueprint for an ideal program in mental health for every local health department—the literature contains many descriptions of specific programs—I shall describe a few common situations in which some departments may find themselves and discuss the implications of each in the local mental health program.

The Psychiatric Clinic

First, let us consider a local health department which is blessed or, as some health officers feel, saddled with a full-time, fully staffed mental health clinic. Probably there has long been pressure in this community to make this service available, and much preliminary work has gone into the establishment of the service, not the least of which was the recruitment of personnel. In these days, a community of modest size that has a full psychiatric clinic team, all present for duty at the same time, can boast of a real achievement. There has been a tremendous effort to increase the number of mental health clinics. Some States have a fairly complete geographic coverage, and service is available either on a full-time or part-time basis even to rural communities, whereas in earlier days only a large urban community had this service. When these clinics were planned they were visualized as a reference point from which the community's mental health program would

emanate. Sometimes there was no real clarity as to how all this would come about, and too often those responsible for starting the clinics did not look beyond the organization and the recruitment, which, incidentally, was a difficult task in itself. There was an expectation that certain mental health miracles would take place once these capable individuals were set up in a clinic.

No doubt in many communities the advent of a clinic has provided this reference point. Where the clinic has been located in the health department, it has made this department a center for mental health instead of functioning as a psychiatric service for a limited number of patients needing care. In many instances the addition of a clinic team to the health department staff has meant a broadened mental health-public health approach to community mental health problems, and there is every expectation that this service will bear fruit in the future.

In too many localities, however, results have not always been successful. A clinic starting out in a local health department with much enthusiastic support and bubbling optimism is, after a period of time, too often found to be moving away from instead of toward a broad solution of mental health problems. When the clinic opens its doors, it generally has an original rush of business which swamps the staff. Very early, staff members become deeply involved in situations which seem to require psychiatric treatment. This results, ironically, in the clinic becoming less and less available as a community resource. The staff retires to the relative protection of a long waiting list, which seems to justify how much the clinic was needed in the community. Then we sometimes find a discontent arising within the health department and in the community. The question is asked: "What have we bought?" The service available seems much narrower than public health people have expected, and disillusionment sets in.

There are many reasons for the development of such situations. Some of the difficulty may be due to the method by which these clinics were originally set up. Ordinarily, the State mental health authority, which is the State health department in roughly 32 out of 53 States and Territories, is active in originating

the clinic. And much of the early support comes from State and Federal funds. Perhaps the continuing role of the health officer in relation to the clinic is not made clear enough at this time. He may feel that this is a State operation and while he tacitly agrees to a clinic in his county, he has no real involvement. Thus, from the beginning, especially if there is insufficient planning as to how this service will blend into existing services provided by the local health department and the community at large, the clinic is viewed as an appendage rather than an integral part of the department. Significantly, many of these clinics are not even located physically in the health department building, and this has seemed to me to highlight the separation.

The psychiatric and ancillary personnel share some of the responsibility for this state of affairs. Generally, they are new to the particular community, with little idea as to the community's needs and problems. For the most part, they come with treatment backgrounds, and since they immediately run into the backlog of cases which can profit from their treatment skills, they never fully realize that there can be more to a mental health service in a local health department than seeing a maximum number of perhaps 30 cases for treatment. They are hesitant in moving out into the community, except for a few speaking engagements on general mental health subjects. Perhaps they are too busy and feel they are pilfering this time from their treatment responsibilities, but also they may be uncomfortable in this broad community public health role.

Within the health department itself, members may look on the clinic as merely a treatment resource or as a welcome haven for those psychiatric emergencies which periodically plague the health officer and his staff, and they may be suspicious of any service beyond that. There is little effort to obtain consultation from the clinic group for those aspects of the total health department program which have mental health implications.

The National Institute of Mental Health, with cooperation from States and hundreds of local clinics, has set up a system of clinic statistics which are now collected on a regular

basis. This system makes it possible to learn what is being done nationally in outpatient treatment settings. It had been suspected that many of these clinics, set up as community mental health activities, were actually devoting a very small fragment of their time to community work in preference to direct treatment activities. A recent compilation of these statistics verified the truth of this belief. We are not prepared to say at this point what percentage of clinic time should be devoted to community mental health activities, but we believe that it should be higher than our statistics tell us it is at the present time.

Perhaps I appear to be minimizing the importance of the treatment role of the clinics in order to make a point about the different kind of responsibility a clinic takes on in a public health setting. I hasten to emphasize that treatment services are valuable and should be available in every community. What more then do we ask of the health department clinic in its relationship to the local health department? I am certainly not suggesting that, in addition to giving treatment services, the clinic staff set itself up as a group of some sort of "super consultants" in all health department activities. However, the clinic staff and health department personnel should move toward a fuller partnership which will make all of the skills of both groups available to the citizens served by both departments. Mental health personnel can no longer live as boarders in the health department household; they must become active members of the family with all that implies.

Does the clinic have a responsibility and desire to promote mental health through educational methods? The health educator, with years of experience in selling health and health programs, can expand his efforts to include mental health. He can be of invaluable assistance to mental health personnel as they move from their treatment activities into their community role. The difference here as far as health education is concerned is in program content, not in method. Likewise, a psychiatrist who acts as staff consultant in a maternal and child health program, or who works with public health nursing groups on the emotional

components in various illnesses, is thereby a member of the public health staff rather than a walled-off treatment resource for a limited number of cases.

Departments Without Clinics

But what of the health department which has no mental clinic and which in all probability will never have one? What are its responsibilities in the mental health field? Do we expect it to develop such a program?

I have visited health departments where the health officers make no claim to a fancy mental health program nor do they expect, with the funds available, to have such an organized program in the foreseeable future. These health officers will, however, describe in glowing terms the activities of their well-baby clinics, where, in addition to good physical care, there is time to help parents learn better parent-child relationships. They speak of public health nurses who know their county—its people, its schools, and its teachers—and who are interested in early case finding of children with emotional difficulties. When you discuss all of this in mental health terms, they brush it off and perhaps disavow it as having any connection with mental health. They say this is all “commonsense,” and “good public health practice.” Whether it is called by any particular name or not, from my point of view, strengthening this kind of service in a local health department leads to improving mental health in the community.

Such strengthening need not wait for the arrival of full-time psychiatric, clinic personnel. It can be propelled along by a health officer who recognizes that he has a broad mental health responsibility. It can be aided by the careful use of occasional consultants for inservice training of staff and evaluation of mental health aspects of certain programs. It can be helped by adding to the staff, from any one of the ordinary psychiatric clinic disciplines, a worker who may bring the knowledge and skills of his specialty to the program and never function in the ordinary, clinical treatment role. In some local health departments, psychologists, social workers, and mental health nurses

are operating in this way. This approach can be advanced when the health department is in the forefront in coordinating community resources or where new resources are being set up to meet the needs of the community.

There are many localities without health departments or possibly with part-time men heading the public health program. To talk of a strong mental health program in these departments is unrealistic, for one can only have such a program where basic health services are adequate and strong. As a matter of fact, strong mental health programs are built not only on strong basic health services, but are dependent also on the availability of other community health and welfare services. Some communities have sought a mental health clinic to meet what appeared to be a pressing need, and it has been necessary to advise the community that it might be better to strengthen the health department or add counseling service to the school system, or provide some form of family service in a private family agency. Are we perhaps asking the impossible of a mental health service when we require it to operate without basic health and welfare services?

Followup Services

Thus far we have looked briefly at the role of the local health department in community education, broad preventive activities, and treatment of early signs of emotional illness. What about that which is referred to as “last ditch service?” We should not discount the role of the health department in providing tangible service to patients entering or leaving the State psychiatric hospitals. Pioneer work in this field has been done in such States as Georgia and Maryland, where public health nurses have been used in an imaginative way in following up these patients. While these programs give indication that they can make a valuable contribution to the care and treatment of mental patients, and while they require continuing evaluation and adaptation, there is no doubt but that there is a place for a local health department to function in this area. Such a program calls for close coordination with the State hospital system with insistence on a clear-

cut line of medical responsibility, more important now with the advent into the community of so many patients on drug therapy.

To some localities this kind of followup seems like a new service, and perhaps in its formal aspects it is. But public health nurses and, in some States, public assistance workers have for years been visiting homes with one or more hospitalized relatives. They have worked with these families before, during, and after hospitalization. The newness in the program is the hospital's awakening interest in what assistance the health department can provide to the hospital in carrying out its responsibilities and to the patient in furthering his adjustment in the community. There must be continued work on the exact nature of the nurse's role. Health departments must know what service the hospital should request from the nurse, and provisions must be made for continued inservice training for the participants so that they are better able to meet the demands which are being made upon them. It means that nurses in health departments will require continuing consultation in the psychiatric and social aspects of these cases. Time and effort spent in this kind of training and consultation will be a worthwhile expenditure since the public health nurse is the department's most effective tie with the entire community.

There is also the responsibility of the local health department for the study of mental health problems in its own local area and for at least modest research into some of these problems. The local health department should also know the adequacy of resources to meet the

needs of its people both in the incipient stage of illness and later, and should be able to use its own records and statistics creatively to better determine the needs and the best kind of service which the community should provide. These surveys need only be the simple, descriptive kind of study and reports which come out of the everyday activities of public health workers.

Conclusion

The health department has an important role in the mental health activities of its community. Clinical treatment of mild cases of emotional disturbance on an outpatient basis is an important community service, but we also recognize that it is only as we approach people's problems on a broader base that we can hope to make a significant contribution toward diminishing the mental health problem.

A mental health program can find room to develop and flourish when it is vested in a strong local health department. Those interested in mental health should see strengthening of their local health departments as a prerequisite to the establishment of their own programs. As pointed out by Charles Mitchell of the Texas State Department of Health, the local health department wishing to make a contribution in the area of mental health must have a deep conviction that since it meets "many people at critical stress periods of their lives, it thereby has an opportunity to affect their mental health favorably." We can only hope that more and more health departments will recognize their potential for so doing.

Increase in Welfare Expenditures

Public spending for social welfare activities of all kinds increased from \$32.2 billion in 1955 to \$34.5 billion in fiscal year 1956, largely as a result of the expanding social security program and increased outlays by States and local communities for education. The increased expenditure represented the same proportion, 8.6 percent, of the gross national product as for the previous fiscal year.

Almost three-fifths of the 1956 expenditures (\$19.9 billion) came from State and local funds, and a little over two-fifths (\$14.6 billion) from Federal funds. The latter figure represented 11.7 percent of the Federal general revenue budget, of which 7 percent was spent on veterans' programs.

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Public Health Awards Added to the 1956 List—Continued

| Name, sponsor, and administrator ¹ | Type ² | Eligibility for award | Basis |
|---|--|---|---|
| Formento Memorial Award. Louisiana Public Health Association (S, A) | Certificate----- | Individual not in full time employment by official public health agency | Meritorious activity to foster the program or any phase thereof in any area of Louisiana |
| Indiana Public Health Association Award. Indiana Public Health Association (S, A) | Plaque----- | Unrestricted---- | Outstanding service in the field of public health. |
| Lasker Award. Albert and Mary Lasker Foundation (S, A) | \$2,000, scroll and statuette, 3 per year | Journalists and commentators | Outstanding reporting on medical research and public health in newspapers, magazines, radio, TV |
| Lasker Award. Albert and Mary Lasker Foundation (S) Planned Parenthood Federation of America (A) | \$500 and scroll, irregular as indicated | Health officers, physicians, administrators, health educators | Outstanding leadership in furthering the cause of planned parenthood |
| Mangold (Outstanding Sanitarian) Award. National Association of Sanitarians (S, A) | Medallion and plaque to the department for 1 year. | Members - | Active environmental sanitarian who has performed duties in an exceptional manner, such as raising the status of the profession |
| McCormack Award. Association of State and Territorial Health Officers (S, A) | Scroll; no set number | do - - | Service in public health 25 years or more, at least 10 as State health officer, and with one or more major accomplishments to his credit in administration or research related to public health |
| McIver (Pearl) Public Health Nurse Award. American Nurses Association (S, A) | Medallion; one every 2 years | Public health nurses | Outstanding public health nurse |
| New Mexico Public Health Association (Public Health Worker) Award. New Mexico Public Health Association (S, A) | Metal platter. | Member of official or voluntary public health unit | Outstanding service to the cause of public health in the State of New Mexico |
| Oklahoma Public Health Association Award. Oklahoma Public Health Association (S, A) | Plaque. | Members -- | Outstanding work in the field of public health |
| Oregon Public Health Association Award. Oregon Public Health Association (S, A) | do - - | Individual public health workers, voluntary agency executives, and lay volunteers | Outstanding contributions in the field of public health in Oregon |
| West Virginia Public Health Association Award. West Virginia Public Health Association (S, A) | - do - | Public health personnel | Outstanding achievement for public health in State |
| West Virginia Public Health Association Award. West Virginia Public Health Association (S, A) | do | Any citizen | Outstanding achievement for public health in State |
| Winslow, C.-E. A. Award. Connecticut Public Health Association (S, A) | do | Public health workers and agencies | Outstanding achievement in public health in Connecticut |

¹ S—Sponsor; A—Administrator

² Except as noted, 1 award is given each year

Public Health Awards

—Supplemental List—

HOMER N. CALVER, B.S.

THIS supplemental list of public health awards brings up to date, as of August 15, 1957, the analysis published in the January 1956 issue of *Public Health Reports* (pp. 62-66). Here as there the list includes awards to lay individuals and persons connected with communication media for contributions to public health or the popular understanding thereof. Omitted are the following categories of honors: (a) those not primarily intended for services in the field of public health unless a public health worker has as much chance of winning the award as does a member of another profession; (b) those given for length of service or

length of membership; (c) those given for published papers describing research as distinct from those for the research itself; (d) those given to former officers and members for service to the organization; (e) election to Delta Omega or to other honorary societies; (f) scholarships and fellowships; (g) honorary lecture-ships.

One award has been dropped from the list and 18 added (see table). A few minor changes in the original listing are noted below:

- The American Hospital Association Award of Merit is now known as the Distinguished Service Award.

- The Axson-Choppin Award originally restricted to a citizen not connected with a health department is now given to an individual not in full-time employment of an official public health agency.

- The Bell Award trophy is now a plaque.

Mr. Calver is secretary of the Public Health Committee of the Paper Cup and Container Institute and editor of its Health Officers News Digest. Robert E. Mytinger, assistant to the secretary, tabulated the awards.

Public Health Awards Added to the 1956 List

| Name, sponsor, and administrator ¹ | Type ² | Eligibility for award | Basis |
|---|---|--------------------------|---|
| Abel Award. Eli Lilly & Co. (S). American Society for Pharmacology and Experimental Therapeutics (A). | \$1,000 at irregular intervals. | Researchers..... | Excellence in research for persons under 35 years of age. |
| Appert Medal. Institute of Food Technologists, Chicago Section (S, A). | Medal..... | Members and non-members. | Outstanding accomplishments in food technology. |
| Barton Memorial Award. Louisiana Public Health Association (S, A). | Certificate..... | Unrestricted..... | Significant achievement in research, scholarship or outstanding pioneering performance in public health in Louisiana. |
| Blackwell (Elizabeth) Medal. American Medical Women's Association (S, A). | Medal..... | Members..... | Distinguished member of the association for contribution to medicine, public welfare, or the association. |
| Bryant Award. Texas Public Health Association (S, A). | Scroll and trip to APHA annual meeting. | Unrestricted..... | Outstanding public health achievements. |

Public Health Awards Added to the 1956 List—Continued

| Name, sponsor, and administrator ¹ | Type ² | Eligibility for award | Basis |
|--|--|--|--|
| Formento Memorial Award. Louisiana Public Health Association (S, A). | Certificate----- | Individual not in full time employment by official public health agency. | Meritorious activity to foster the program or any phase thereof in any area of Louisiana. |
| Indiana Public Health Association Award. Indiana Public Health Association (S, A). | Plaque----- | Unrestricted----- | Outstanding service in the field of public health. |
| Lasker Award. Albert and Mary Lasker Foundation (S, A). | \$2, 000, scroll and statuette; 3 per year. | Journalists and commentators. | Outstanding reporting on medical research and public health in newspapers, magazines, radio, TV. |
| Lasker Award. Albert and Mary Lasker Foundation (S). Planned Parenthood Federation of America (A). | \$500 and scroll; irregular as merited. | Health officers, physicians, administrators, health educators. | Outstanding leadership in furthering the cause of planned parenthood. |
| Mangold (Outstanding Sanitarian) Award. National Association of Sanitarians (S, A). | Medallion and plaque to the department for 1 year. | Members----- | Active environmental sanitarian who has performed duties in an exceptional manner, such as raising the status of the profession. |
| McCormack Award. Association of State and Territorial Health Officers (S, A). | Scroll; no set number. | -----do----- | Service in public health 25 years or more, at least 10 as State health officer, and with one or more major accomplishments to his credit in administration or research related to public health. |
| McIver (Pearl) Public Health Nurse Award. American Nurses Association (S, A). | Medallion; one every 2 years. | Public health nurses. | Outstanding public health nurse. |
| New Mexico Public Health Association (Public Health Worker) Award. New Mexico Public Health Association (S, A). | Metal platter----- | Member of official or voluntary public health unit. | Outstanding service to the cause of public health in the State of New Mexico. |
| Oklahoma Public Health Association Award. Oklahoma Public Health Association (S, A). | Plaque----- | Members----- | Outstanding work in the field of public health. |
| Oregon Public Health Association Award. Oregon Public Health Association (S, A). | -----do----- | Individual public health workers, voluntary agency executives, and lay volunteers. | Outstanding contributions in the field of public health in Oregon. |
| West Virginia Public Health Association Award. West Virginia Public Health Association (S, A). | -----do----- | Public health personnel. | Outstanding achievement for public health in State. |
| West Virginia Public Health Association Award. West Virginia Public Health Association (S, A). | -----do----- | Any citizen----- | Outstanding achievement for public health in State. |
| Winslow, C.-E. A., Award. Connecticut Public Health Association (S, A). | -----do----- | Public health workers and agencies. | Outstanding achievement in public health in Connecticut. |

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- The Crumrine Awards medals are now medallions.

- The Florida Sanitarians Scroll is now the Florida Association of Milk and Food Sanitarians Scroll.

- The Massachusetts Association of Sanitarians Scroll has been discontinued.

- The North Carolina Public Health Association Award citation certificate is now a plaque.

- The Rankin Award trophy has been changed to a plaque.

- The Reynolds Award trophy has been changed to a plaque.

- The Ross Medal given by the National Tuberculosis Association may now be awarded to

medical practitioners and scientists as well as to those outside.

- The Shattuck Award originally one award is now approximately six per year.

- The Sippy Award is no longer restricted to the members of the district in which the annual meeting of the Western Branch of the American Public Health Association is held.

- The White Memorial Award plaque has been changed to a scroll and is restricted to a full-time employee of any official health agency instead of to any member of the State department of health.

- The honorarium of the original 3 Lasker Awards has been doubled and 2 more awards, 1 of lesser value, have been set up.

Reactions to Penicillin

The number of serious reactions to penicillin has been increasing each year according to Dr. Henry Welch, chief, Division of Antibiotics, Food and Drug Administration, reporting before the Fifth Annual Symposium on Antibiotics, October 3, 1957.

A substantially higher number of reactions to penicillin than to other antibiotics were discovered by an FDA survey, the first nationwide study of reactions to the principal antibiotics, covering a period from the latter part of 1953 to early 1957.

The number of reactions to penicillin is still small, Dr. Welch pointed out, when it is considered that millions of persons receive the drug each year and that it has saved tens of thousands of lives. The increased incidence of reactions, he added, is to be expected in the wide use of a highly antigenic substance.

The FDA survey was a geographic sampling of severe cases treated by more than 1,600 private physicians and covered 198,000 of the 685,000 general hospital beds available in this country. The survey was conducted by inspectors in the agency's 16 districts.

In the survey, 3,419 histories of severe reactions to all antibiotics were collected and

classified. Of these, 424 were excluded from the tabulation because of insufficient data. One-third of the reported reactions were classified as life-threatening. Of these, 900, the great majority, followed the use of penicillin. More than 600 of the most serious reactions resulted from penicillin by intramuscular injection. In 122 of these cases, penicillin was used in combination with streptomycin and dihydrostreptomycin.

Intramuscular injections were followed by 71 deaths from anaphylactoid shock, the most serious reaction. Anaphylactoid reactions occurred with about equal frequency in both sexes and in all adult age groups. The smallest number of these reactions occurred in children 12 years of age and under.

Although no physicians were found to be using penicillin indiscriminately, Dr. Welch thought that the trend in serious reactions indicated that there should be a clear-cut need before the drug is administered.

The complete report will appear in the December issue of *Antibiotic Medicine and Clinical Therapy*. FDA officials plan other dissemination.

The Dynamic Approach to Arthritis

EDWARD W. LOWMAN, M.D.

OF all chronic diseases, arthritis is second only to nervous and mental diseases as a cause of illness in the United States (1). It causes more years of disability than do all types of accidents and disables seven times as many persons as does cancer (2). More than 10 million persons in this country suffer from some type of rheumatic complaint, and 2½ million of these have had to change or stop their work because of their disease (3). It is reliably estimated that 147,000 persons in the United States are invalided each year from rheumatic diseases (4).

While rheumatic diseases exact a high toll in morbidity, their mortality is extremely low; the reservoir of persons so afflicted is thus ever growing. In the face of the rising incidence of chronic and degenerative diseases, the socio-economic gravity of this situation is readily apparent. Rheumatic diseases lead all others in crippling and in economic loss. They account for a loss of 97 million man-days and a quarter of a billion dollars in wages annually in the United States (1). Finally, it should be remembered that arthritis is not a disease of the aged only, but that it may affect infants and adolescents as well. The two most common and most crippling forms, rheumatoid arthritis and rheumatoid spondylitis, preponderantly affect persons in their third and fourth decades.

Arthritis as a diagnosis is nonspecific; by definition it means "inflammation of a joint." The types of arthritis are legion, probably numbering more than 100, and the treatment

and the prognosis vary greatly among these many types. In considering rehabilitation it is important, therefore, that an etiological as well as a pathological diagnosis be established before medical, physical, or vocational measures of treatment are undertaken. The majority of cases fall within 7 major categories, and 2 types, rheumatoid and degenerative joint disease, account for 70 percent of the cases (6).

Ten years ago, arthritis was a disease of unknown etiologies and of dismally poor treatment prognoses. The introduction of steroid therapy in 1948 catalyzed a renaissance of interest and research that in a decade has developed more basic knowledge, better diagnostic aids, and more effective treatment measures than were developed in the preceding century. While much remains to be learned, great strides have been made. Amidst this optimism of progress has come a change in attitude toward the crippled arthritic, an attitude crystallized by favorable results attained in both physical and vocational rehabilitation studies. Because of these studies, crippled arthritics can no longer be considered negatively as candidates for rehabilitation, for with proper selection and careful treatment many can be salvaged for productive lives (5).

As with all chronic diseases, the effects of arthritis ramify far beyond the physical sphere. Though the pathological affliction is primarily one of damage to intra-articular structures, the consequent disability imposes restrictions and demands adjustments in all areas of living: physical, social, economic, psychological, vocational, and recreational. In considering such a patient for rehabilitation, therefore, evaluation and treatment must be directed toward all the many facets of his condition. Proper diag-

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nosis and appropriate medical therapy for control of the arthritic process are, of course, of primary importance. In addition, it is imperative that the patient's functional capacity be assessed and his psychosocial status investigated. Limitation of joint ranges of motion, weakness within muscles, and functional proficiency in the performance of activities essential to independent living must be specifically tested. Further, the psychological, social, economic, and vocational aspects must be studied in detail.

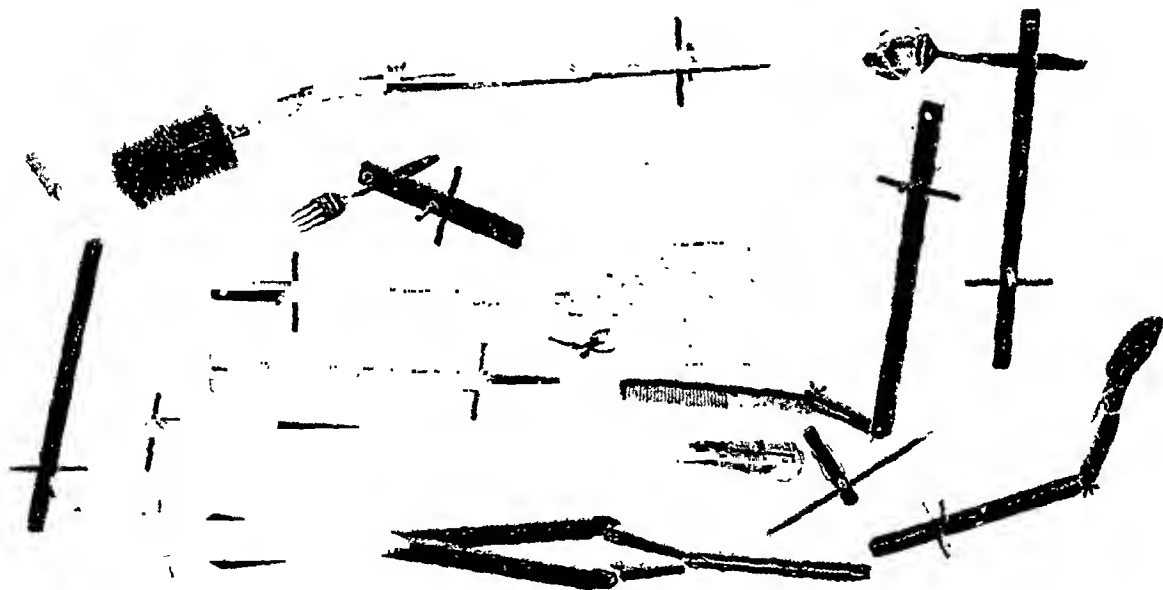
The extent of the problem of rehabilitation for the individual patient, then, is in direct proportion to the deficits in the various areas, and treatment must be directed toward alleviation of these various deficits. Rehabilitation may consist only of proper job placement, or it may involve, for a severely disabled patient, hospitalization and intensive full-day treatment with physical therapy, occupational therapy, remedial exercise, functional training, psychological and psychiatric assistance, vocational guidance, and job retraining.

The degree of success in the rehabilitation of the disabled arthritic is influenced by eight major factors:

Type of arthritis. Prognosis varies consider-

ably among the different types of arthritis, which range from the static involvement of a single joint to the fulminating migratory type accompanied by marked systemic manifestations in addition to the joint pathology. These are extremes, but they indicate the wide prognostic variations.

Extent of damage within joints. Arthritis results in destructive changes within the involved joints. These changes impair the mechanical integrity of the joint and, in direct proportion to the impairment, modify the tolerance of the joint for physical activity. Since weight-bearing joints are "workhorse" joints, damage to a knee or a hip, for example, will be more restrictive than a similar degree of damage in an elbow or wrist, which is concerned more with dexterity and prehension. Physical activity for a patient must be maintained within the pain tolerance of the joints to prevent further deterioration from overuse. Correction of deformity, especially in weight-bearing joints, building muscle power to a maximum through remedial exercises, and use of braces may often increase a joint's tolerance for activity. The extent of damage, however, remains an important modifying factor.



Devices with added length enable the arthritic patient to perform many daily self-care activities.

Adequacy of medical therapy. For those types of arthritis that may be improved through medical therapy, the degree to which the process may be controlled directly modifies the rehabilitation goals. Chronic gouty arthritis, for example, can usually be improved considerably through drug therapy. By means of steroid therapy, most cases of rheumatoid arthritis can be partially, if not almost completely, controlled. Disseminated lupus erythematosus, on the other hand, presents a much more complex and difficult treatment problem, and the ineffectiveness of medical treatment may be reflected directly in ineffective total rehabilitation.

Motivation of the patient. It is easy to establish goals for an arthritic patient that are compatible with his physical and intellectual capacities, but it is not so easy to know that the goals are within the scope of his motivation. To help the patient develop motivation, every effort should be exerted at the start of a rehabilitation program to give him a thorough understanding of arthritis as a disease, of treatment limitations, and of reasonable goals to be expected, and to instill in him the insight to appreciate that much of what can be accomplished can be done only through hard work and cooperation on his part. Patients who cannot be approached on such realistic ground will be failures in rehabilitation programs and should not be accepted for treatment (6).

Applicability of self-help devices. Among patients with deformities or restrictions in joints which mechanically prevent the performance of essential functions, it is often possible to bypass such impediments with special gadgets or self-help devices (see illustration). More than 300 special devices are currently available to assist the arthritic in eating, dressing, personal hygiene, ambulation, and transportation (7). These range from long-handled combs for patients who cannot reach their heads to motorized wheelchairs for those with arms too crippled to propel a standard wheelchair. The intelligent selection of such devices for the disabled patient often can open wide new vistas of self-sufficiency and independence.

Functional training. While joint ranges of motion, muscle power, and the joint's tolerance



An arthritic patient is retrained in ambulation and elevation activities.

for activity are rough indexes of a patient's functional capacity, they have no significance unless they can be utilized in performance of function. Functional training, therefore, is an important part of a patient's daily treatment program. The human body as a machine is a grossly inefficient mechanism, probably less than 25 percent efficient. Thus, even in the face of severe mechanical disabilities patients may be trained to a considerably higher degree of efficiency to compensate for irreversible physical deficits.

Corrective orthopedic surgery. It is no longer felt that arthritic patients should wait for their disease to reach far-advanced stages before being offered the advantages of corrective orthopedic surgery. In fact, from a standpoint of protection of joints against additional mechanical wearing, corrective surgical procedures are at times urgently indicated. The correction of a knee flexion contracture or a hip deformity, for example, may appreciably expand a rehabilitation goal.

Social, economic, and vocational factors. Since chronic disease ramifies its effects into all areas of living, total rehabilitation implies assistance in the solution of these facets of the problem. Success depends upon the resources of the patient and the degree of active assistance afforded the patient by the social worker and the vocational counsellor. The most difficult goal to attain in the rehabilitation of the arthritic is job placement. Even in this sphere, however, it has been demonstrated that through careful assessment of psychological and vocational aptitudes, plans for job placement or job retraining compatible with the physical disability can usually be worked out (8).

Summary

The patient disabled with arthritis frequently may be successfully returned to productive and independent living. Rehabilitation, however, must be directed toward the total problem created by the disease. The success of treatment may be predicted in terms of eight major modifying factors. Although a difficult prob-

lem, the disabled arthritic is by no means beyond help if he is dynamically dealt with.

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Public Health Mission to the U.S.S.R.

Five public health physicians from the United States recently spent a month in the U.S.S.R. on an exchange mission headed by Dr. Thomas Parran, dean, Graduate School of Public Health, University of Pittsburgh, and former Surgeon General of the Public Health Service. The visit lasted from August 13 into September of 1957.

Arranged by the Public Health Service in cooperation with the U. S. Department of State, the mission cultivated relationships between public health and medical leaders in both countries.

The itinerary included administrative headquarters, industrial and agricultural health departments, hospitals, urban and rural dispensaries, industrial medical stations, research institutes, and medical schools, in 5 of the 15 republics of the U.S.S.R. in Europe and Asia.

A reciprocal Soviet Union public health mission arrived in the United States in October for a month's stay.

With Dr. Parran on the mission were Dr. Malcolm Merrill, director of public health, California State Department of Public Health; Dr. Otis L. Anderson, Assistant Surgeon General, Public Health Service; Dr. H. van Zile Hyde, chief, Division of International Health, Public Health Service; and Dr. Leonid Snegeriff, associate professor, department of public health practice, Harvard School of Public Health.

Poliomyelitis Vaccination Campaign

About 45 million Americans under 40 years of age have received no poliomyelitis vaccine, and 30 million have yet to complete the full schedule of 3 doses.

"These people," Marion B. Folsom, Secretary of Health, Education, and Welfare, warns, "are needlessly risking disability or even death."

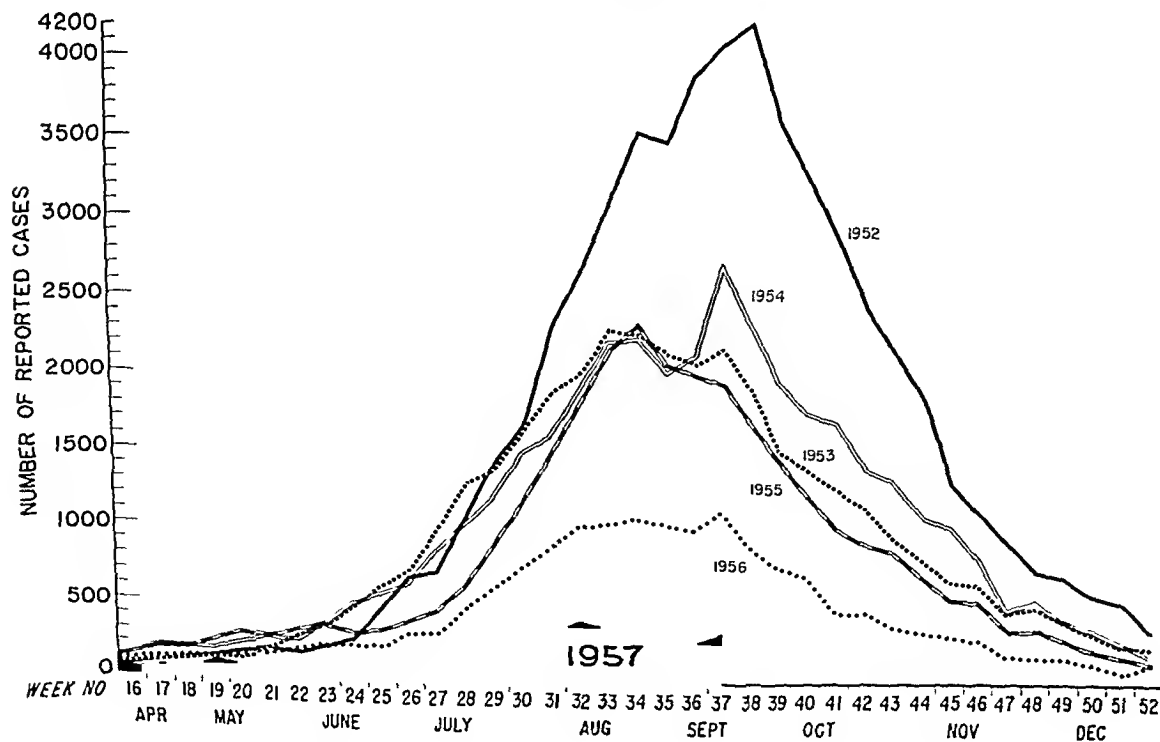
"For many years," Mr. Folsom notes, "this country anxiously sought the means to avert the suffering and anguish caused by poliomyelitis. Today with steadily increasing supplies of Salk vaccine, the means are at hand. If people will use the vaccine available, it is possible to give paralytic poliomyelitis a knockout blow within the next year."

To this end the Public Health Service, the National Foundation for Infantile Paralysis, the American Medical Association, State and Territorial health officers, and the Advertising Council are all joining in a campaign to urge vaccination of as many persons as possible with the full recommended schedule of three doses.

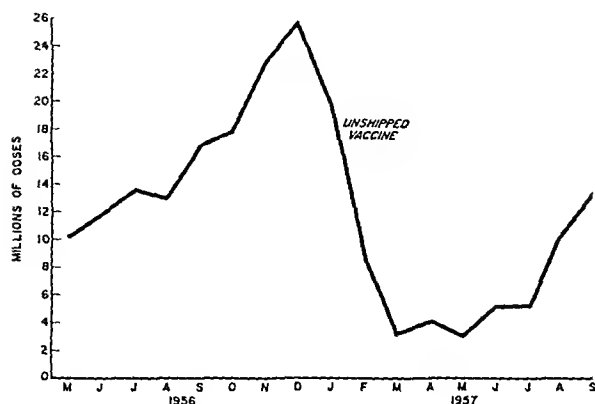
In urging a campaign for vaccination the Secretary pointed out that this is the best time for medical societies, local health departments, schools, industries, and individual citizens and physicians to make sure that everyone who needs protection gets it.

In the fall of 1956 use of the vaccine dropped sharply and supplies piled up in warehouses. By spring the demand rose to such a peak that

Current poliomyelitis incidence in the United States compared with 1952-56



Manufacturers' reports of unshipped vaccine, by month, 1956 and 1957



supplies were short again, and many community and industry vaccination programs had to be postponed.

The following summarizes to October 1957 vaccination effects, production, and use.

Incidence

An 80 percent reduction in paralytic poliomyelitis has occurred in this country since 1955.

During the first 9 months of this year, 1,576 paralytic cases were reported compared with 7,886 cases in 1955, before the widespread use of the Salk vaccine, and 5,241 cases in 1956.

Only 63 cases of paralytic poliomyelitis were reported among the 34 million persons who received 3 shots of vaccine, and not all of these cases have been confirmed.

Although the vaccine is designed to prevent paralytic poliomyelitis, as distinguished from

nonparalytic, the total number of poliomyelitis cases this year also shows a sharp reduction. For the first 9 months of 1957 there were 4,851 cases compared with 21,667 for the same period in 1955 and 12,146 in 1956.

Vaccine Production

More than 215 million cubic centimeters (doses) of vaccine were released for public use between April 1955 and early October 1957. Production is presently 8 to 10 million cubic centimeters a month.

For the first time it now appears possible to have enough vaccine to protect substantially all the population under age 40 before the start of the 1958 season.

Vaccine Use

Of the Nation's 109 million persons under 40 years of age, more than 64 million had received one or more doses of vaccine. Estimates indicate that of the 63 million in the priority group under age 20, 30 million had received all 3 injections, 15 million had 2 injections, 3 million had 1 injection, and 15 million had received no vaccine. Many in the under-20 age group who still need vaccination are preschool children and teen-agers.

Poliomyelitis can and does strike severely at adults. However, of the 46 million persons 20-39 years old only 16 million had been vaccinated: 4 million with 3 doses, 10 million with 2 doses, and 2 million with 1 dose. But 30 million adults had had no vaccine.

New Hazardous Substance Law in Texas

A law prohibiting the sale of any substances containing more than 1 percent of any thallium salt went into effect in Texas on August 22, 1957. The new law also forbids the mixture of poisonous substances with food, unless that food has lost its identity as such and is not likely to be mistaken for it.

Passage of the law followed the death of 15 children who had eaten insecticides containing thallium during the year. In November 1956, a 5-year-old girl in Houston died after eating cookie crumbs treated with such an insecticide.

Environmental Safety for Industrial Uses of Radionuclides

ARTHUR E. GORMAN

IN THIS AGE of seemingly endless technological advances, alert public officials and prudent leaders in industry are coming to realize more and more that they have many common interests, and that in a large measure these interests rest on environmental considerations. Of particular importance to industrial uses of nuclear energy are weather conditions, local and regional topography, geology and hydrology, the influences of tides and currents in coastal waters and estuaries, the physical and chemical characteristics of soils, the surface cover whether in the natural state or cultivated, and the myriads of living organisms which serve to maintain a biological balance in our environment.

These environmental factors have profound influence on whether or not a specific area or region is a desirable place to live. They are also of prime importance in deciding whether or not an area is one where a new industry should be established, and, once established, whether capable of expansion without serious limitations. Such limitations may be those set by management as a result of operating experiences or those applied by public regulatory agencies in the interest of public health and safety or for the protection of natural resources.

The atomic energy industry, born as a war-time expedient and nurtured in strict secrecy

is now in its 12th year. It is expanding rapidly. Farsighted leaders in industry and in Congress recognized that this industry would present special problems because of its rapid expansion and the hazardous nature of its products and byproducts. Wisely, they have insisted that precautions be taken to avoid errors made by other industries. What is more important, they have provided funds for research and development in order to appraise factors of public safety and economy.

It is doubtful whether any other major industry has evaluated its impact on people and their environment as has the atomic energy industry. Among the many reasons are the following:

- The products and wastes of the industry are both toxic and radioactive; they therefore present potential hazards to man and his environment.
- The kinds of radioactive materials used are many, and their levels of activity vary widely.
- The period of radioactivity of certain nuclides is so long that special consideration must be given to their storage and disposition and to the effect of these practices on the environment.
- The rapidly advancing technology of the industry on many fronts is presenting problems of expansion and obsolescence.
- The effects on man of exposure to low levels of radiation, especially the cumulative effects, are not precisely determined, although there is general agreement that any dose of radiation to the gonads increases the rate of genetic mutation.
- The staff of regulatory agencies responsible for public health and safety and for protection

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of natural resources are not as yet sufficiently trained in the technology of the industry or sufficiently expert in helping to prevent environmental contamination.

In these circumstances, it is essential that both management and public officials understand and evaluate the relative importance of the various phases of the industry and its products and by-products. Because the demand for expansion of the industry is of deep significance to the economy and defense of nations all over the world, it is vital that no unnecessary blocks be placed in the way of progress. What is called for is a healthy balance between the requirements for public health and safety and the needs of the industry in its inevitable surge forward. Trained manpower is essential to achieve that balance.

Classification of Nuclear Operations

The hazards of the atomic energy industry are related primarily to the specific activity of the materials used and of the products and by-products developed. It is therefore important that various operations be classified according to their environmental impact. For this discussion, the following classifications will be helpful:

Mining, handling, and storage of raw ores. Since radioactive radon gas is given off by raw ores, work areas must be well ventilated and free of dust. Application of well-established hygienic principles for the mining industry should be adequate. Tailings must be handled in such a way that losses to drainage areas will be within reason. This is not difficult since the weight of the ore favors recovery by sedimentation.

Production of nuclear fuel. Most of the materials used in the production of nuclear fuel from raw ores or from reclaimed fissionable material have low specific activity and a long half-life. Operations are similar to those in specialized chemical and metallurgical plants. Dusts and fumes must be kept under control. In addition, more than average attention should be given to inplant and offplant monitoring for radioactivity and to disposition of wastes.

Enrichment of fissionable materials for fuel. Here again the level of radioactivity is low,

and usually the materials have a long half-life. Processing is in various stages, the more important resulting in gaseous fluorides of uranium. Under proper controls, release of fluorine gas and disposition of wastes, as in soluble fluorides, present no serious environmental hazards.

Research and development. Research in laboratories, hospitals, and manufacturing plants of various kinds usually uses small amounts of radioactive material, and, for the most part but not always, the levels of radioactivity are low. Research uses are expanding, and the places where radionuclides are used are becoming more numerous and geographically more widespread. Conditions under which radioactive materials are sold for research, however, are such that environmental hazards from this use are likely to be of low order.

Operation of nuclear reactors. It is in this area of the industry that materials with high specific activity are employed. The amounts and characteristics of the products and wastes are of importance with respect both to on-site protection of workers and to potential off-site environmental hazards.

Test and research reactors operated at low levels of energy and with small amounts of radioactive fuel are in demand by educational institutions and industry. Designs are conservative and operations are subject to strict regulation. Usually such reactors are a low-order risk from the standpoint of environmental hazards.

Research reactors for testing new designs, new fuels, or new fuel assemblies are a special group and are subject to strict supervision by the Atomic Energy Commission under the terms of their permit from that agency. They are built at areas under AEC control. Examples are the National Reactor Testing Station in Idaho, the Knolls Atomic Power Laboratory, and the Argonne, Brookhaven, and Oak Ridge National Laboratories.

Reactors for testing materials and facilities, for producing fissionable material or for developing power experimentally, or for commercial use constitute the major environmental hazards. Their design and construction are subject to thoroughly critical review and their operations

are rigidly controlled. These reactors use substantial amounts of fissionable materials. Usually they are operated at high power levels, and the amount of heat generated may be prodigious. Examples of such reactors are the materials-testing reactor (MTS) at the National Reactor Testing Station, the production reactors at the Hanford Works in Washington and at the Savannah River Works in South Carolina, and the pressurized water reactor for power production now nearing completion at Shippingport, Pa.

Processing irradiated fuels. Chemical processing plants are necessary to separate unspent reactor fuel from fission products created as a result of neutron bombardment of fissionable material in the reactors. Large plants of this kind are operated, under AEC control, at the Savannah River and Hanford Works and at the National Reactor Testing Station.

Site Selection

Selection of a site for an atomic energy plant is one of the most important decisions management has to make. The site profoundly affects factors important in company policy, finance, and public relations. Among these are layout and design of structures and facilities, pattern of future expansion, day-to-day operations, and safety of employees or persons and property in the vicinity of the plant.

In the atomic energy industry, perhaps more than in any other, decisions as to a plant site focus largely on anticipations of the character and quantities of wastes to be released. This is particularly true for nuclear reactors and associated chemical processing plants where levels of radioactivity in product and wastes are high. With modifications, it also holds for feed material processing and nuclear fuel fabricating plants, research laboratories, and other places, where materials used have lower levels of radioactivity.

During World War II, the Government-owned atomic energy plants were located in areas of relatively low average population density. Sites were selected partly for reasons of security, but also because of availability of power and water. Since then, there has been opportunity to evaluate performance and prac-

tice. New plants have been built and old ones have been refitted. Much has been learned which now can be put to peaceful service.

With relaxation of security regulations concerning technical information and authorization for wider uses of nuclear materials given in the 1954 Atomic Energy Act, the interests of private industry in exploring the opportunity to use atomic energy have been pronounced. It seems likely that since these ventures will be organized and financed in an open competitive field, corporations will prefer to locate plants at strategic places in relation to the market and reasonably near populated areas. When it seeks a site for this new enterprise, a company wishing to build a plant to use atomic energy or to manufacture a product using radioactive materials must face up to its responsibilities.

One of the first considerations will be the possible concern of citizens of nearby communities as to hazards, real or imaginary, an atomic energy plant may bring to the area. Sometimes public officials may not accord an atomic energy plant the welcome they normally extend to a new industry, for they may be concerned over the future effects of this industry on the health of the people and the safety of the environment of their communities. This attitude is entirely understandable.

Experience has shown that the greatest concern of public officials over the location of atomic energy plants in their jurisdiction pertains to storage, release, or disposition of radioactive wastes. The interest that the public now shows in clean streams, preservation of recreational areas, protection of surface and underground sources of water supply, and clean air is a sign of progress in environmental sanitation. It may also be a portent of trouble for any industry so shortsighted as not to plan to meet reasonable requirements to reduce hazards related to disposition of its wastes. On the other hand, unreasonable demands on industry in the degree of waste restriction could seriously affect the interest of the industry and the community or region under consideration.

Radioactive wastes may be in the form of solids, liquids, or gases, and at times they may be in intermediate states as colloids. Problems associated with disposition of radioactive wastes are unique. The effects of radiation can

be immediate or delayed. Radiation is an insidious contaminant with cumulative damaging effects on living cells. Certain highly active radionuclides continue to give off energy over long periods of time, to persist through many generations. These are facts of deep importance in evaluating risks and in establishing protection against them. They must never be forgotten in selecting a plant site, and in planning or practicing disposition of radioactive wastes.

High-Level Wastes

High-level wastes may contain as much as 10^2 curies of radioactivity per liter. In normal operations, their principal source is in the processing of irradiated fuel elements. The cost of treatment and disposition of these wastes is high. If nuclear power is to compete with other fuels, cheaper methods of waste disposition must be found. Cutting of costs must be done intelligently; unsound economies may introduce risks of environmental contamination.

Disposition policies are especially important with regard to high-level radioactive wastes that contain long-lived and biologically significant fission products, such as strontium-90 and cesium-137, and others with shorter half-lives, such as cerium-144 and ruthenium-103, and certain isotopes of rare earths, that may be difficult to control when released to soils.

Fixation on Soils

Nature provides some important potentialities for resolving environmental problems. These are being studied in order that they may be taken advantage of in reducing the cost of disposition of wastes from reactors and plants for chemical processing of spent fuels from other sources. Fortunately certain soils and the suspended and bed loading of most waterways have properties of absorption or adsorption of radioactivity. The exchange capacities of soils for radionuclides can be affected seriously by nonradioactive ions in wastes. This complex should be fully evaluated in deciding on the degree of pretreatment required before wastes are disposed to the ground. The heat in high-level wastes resulting from gamma radiation introduces an important problem in the disposition

of these wastes. Research in ground disposition of wastes is under intensive investigation by the Oak Ridge National Laboratory, with the cooperation of the Earth Sciences Division of the National Research Council, and at several other AEC installations, notably at the Hanford Works.

The requirements of environmental protection could be met by fixing radioactivity in columns of selected and pretreated clays or other suitable material and then raising the temperature sufficiently to form a solid ceramic mass from which the wastes could not be elutriated or leached. Such a mass could then be stored in a selected area or be buried in a tight soil designated by a geologist as suitable for waste storage. Research to determine feasibility and cost of such a method is under way at the Brookhaven and Oak Ridge National Laboratories and the Los Alamos Scientific Laboratory.

Ground Storage

Two methods of ground storage may be feasible for highly radioactive liquid wastes. One is by pumping these wastes into cavities dissolved in deep salt deposits or salt domes. The other is by pretreating the wastes at the surface and then pumping them to the connate brines in closed basins at great depth and in areas where natural resources would not be unfavorably affected. The potentialities of each method are attractive, but much research must be carried out before it can be established that either is economically feasible and safe or even acceptable to responsible regulatory agencies.

Should either or both of these methods prove satisfactory, the presence of suitable deep strata would be an important factor in selecting a site for a chemical processing plant. It is conceivable that in the future the production of fission products will outrun the demand for selected radionuclides in wastes for use as radiation sources. In that event, disposition of high-level wastes from chemical processing plants directly to deep strata would have considerable advantage over the present practice of storing radioactive wastes in tanks near the surface.

Another possibility for lessening the environmental hazards associated with storage of high-

level radioactive wastes is to remove the long-lived and biologically significant nuclides from the wastes prior to disposition. If this were done, wastes could be disposed to the ground in selected areas with greatly reduced environmental hazards. Almost complete removal of the high-level radionuclides, more than 99 percent, would be necessary.

Land Burial and Tank Storage

Land burial is an economically attractive method of disposing of solid radioactive wastes, but it presents serious environmental problems. An experienced geologist must assist in selecting burial grounds. Burial grounds should be fenced and well identified. They should be kept to a minimum in number since they may become so contaminated as to be unfit for any other use.

Underground storage in tanks without fixation of the high-level, long-lived radionuclides could affect the health of future generations. Tanks containing radioactive wastes, as well as waste burial grounds, should be located so that if leakage occurs pollution of ground water will be minimized. Preferably tanks should be set well above the water table and in tight soils from which movement of any leakage would be slow. Storage areas should be monitored periodically to detect any leaks.

Tank storage is not a final solution of the waste problem. The wastes may be radioactive for a century or more whereas the tanks in which they are stored may be expected to corrode and leak within decades. Therefore, this method of disposition obviously permits a potential environmental hazard to persist, even though transfer from old to new tanks is possible.

Storage of high-level radioactive wastes in underground tanks as currently practiced has the advantage of confining the wastes and of allowing time for decay of radioactivity. But provisions to remove heat from tanks often are required, and the method is costly.

Low-Level Wastes

Release of low-level radioactive wastes, whose activity is 10^3 or 10^4 in excess of permissible long-term limits of exposure, may also produce an environmental hazard. Because the

quantities of these wastes are large, release to the atmosphere, surface waterways, or the ground is economically attractive and has possibilities if conditions are favorable for dilution.

Extensive research in determining the significant parameters for appraisals of favorable dilution factors in nature is being carried out under Atomic Energy Commission contracts with the Weather Bureau, the Geological Survey, and several universities. Staff of AEC and its operating contractors at the Hanford Works, the Knolls Atomic Power Laboratory, the National Reactor Testing Station in Idaho, and the Brookhaven, Argonne, and Oak Ridge National Laboratories are conducting similar research.

Remote Locations

Within the next decade atomic energy plants may be built in remote places throughout the world where the need for power is so important that the factor of cost or the competitive price of solid fuels may not be significant. Here again the industry has a real obligation to maintain high standards of safety and environmental sanitation. Even though initially exposure of people and property in such areas may be slight, a reckless attitude toward disposition of long-lived wastes should not be permitted. With advancement in travel and transport to these areas and perhaps unpredictable uses of their natural resources, careless practices in this generation in the interest of low costs could preempt use of these resources by future generations. History is replete with examples of the penalties paid by subsequent generations for the reckless, uncontrolled actions of their forefathers.

Plant Expansion

In site selection, serious consideration should be given to the possibility or probability that a plant as originally built may be enlarged or its functional processes changed with relatively greater hazard. When a plant or site planned for one purpose is put to another use, it is important that such basic services as utilities, waste systems, and points of release of waste

effluents be restudied to ascertain their adequacy for the new use. Modification should be discussed with public officials responsible for public health and safety. If the original plant is served by public utilities, such as water, power, and sewers, this obligation is all the more pressing.

Selection of a site for an atomic energy plant calls for the integrated judgment of competent people from a variety of professions. These might include nuclear and health physicists, biophysicists, physical and nuclear chemists, structural and ground water geologists, nuclear, chemical, sanitary, and safety engineers, industrial hygienists, ceramists, biologists, mineralogists and soil scientists, meteorologists, hydrologists, public planners, and others. Important among the assignments on which these specialists should assist are:

- Selection of sites for various units of a plant, making the best use of area topography and environmental conditions.

- Availability of water for processing and for domestic uses.

- Type, capacity, and location of waste storage and treatment facilities.

- Degree of waste treatment required initially and later in a progressive expansion program.

- Points and methods of discharge of waste effluents.

- Sites for burial grounds for radioactive and toxic wastes.

- Dilution factors in nature which could be used in disposition of wastes.

- Selection of monitoring points for establishing information on background radiation and subsequently the effect of day-to-day operations on background.

- Development of program for evaluating environmental hazards in the event of a serious accident or spill and for notifying public officials promptly so that proper warning may be given to off-site populations and industries.

Under normal operations, waste products from a reactor or chemical processing plant operating on a continuing basis can be pre-

dicted and a program for on-site decontamination planned so that the ultimate dilution of radioactive gaseous or liquid effluents released will be such as to protect against environmental exposures of significance. But in selecting a site for such plants, it would be unrealistic to assume that operations will always be normal. In evaluating environmental hazards, it would be prudent to accept certain pessimistic positions.

Management of most industries seeks insurance against accidents that may affect employees, plants and facilities, and lives and property in the environs of the plants. Insurance in connection with atomic energy plants is complex. Experience is too limited to establish the probability of occurrence of a major accident. The gross potentialities of an accident and its aftermath, especially for reactors and chemical processing plants, are reasons for concern. (The 85th Congress approved insurance up to \$500 million a risk against reactor accidents above the \$65 million which private insurance companies are prepared to underwrite. The damage from a reactor accident is estimated by AEC to be in the billion dollar range.)

The alternative to selecting a remote site to reduce the possibility of exposing off-site populations to radiation should an accident occur is to confine the reactor within a tight shell strong enough to withstand an explosion and prevent escape of fission products and other hazardous materials. An example is the steel sphere 225 feet in diameter and nearly an inch thick which encloses the submarine test reactor at West Milton, N. Y. The cost of providing such protection for a small research reactor or a large power reactor may be less than the cost of locating the facility a great distance from the area the reactor is to serve.

Careful planning is needed if plants for the use of atomic energy for peaceful purposes are to be built near populated areas. This new industry must avoid the mistakes of other great industrial enterprises in which early enthusiasm for expansion shaded judgment.



Radiological Health

NEARLY 2,000 physicians, radiologists who specialize in the diagnostic and therapeutic use of ionizing radiations, met in Washington on October 1-4, 1957, to discuss methods of protecting patients against unnecessary exposure to radiation.

The occasion was the 58th annual meeting of the American Roentgen Ray Society. In addition to the theme of radiation protection, the meeting offered papers on other scientific subjects, postgraduate refresher courses, and many scientific exhibits.

The annual Caldwell lecture was delivered by Dr. Eugene P. Pendergrass, professor of radiology at the University of Pennsylvania, on the subject, Atmospheric Pollutants and the Radiologist.

Dr. Wendell G. Scott, incoming president of the American Roentgen Ray Society, listed five questions which a patient might ask his doctor in advance of X-ray studies.

1. Is the examination necessary? (Let the doctor determine this: it is his responsibility.)
2. What physician is to make the examination?
3. Has the examining physician, if other

than a radiologist, received formal training in radiology? If so, how much, and will there be a written report of the examination acceptable to other physicians?

4. Is the technician who will assist in the X-ray examination certified or qualified by formal training?

5. Would you choose your surgeon without asking similar questions? (Physicians who make radiological examinations should be selected with the same care.)

Training Recommended

Dr. Scott, professor of clinical radiology at the school of medicine at Washington University, St. Louis, emphasized the need for more training in radiobiology and in the proper use of radiation for medical students, internes, residents, and postgraduate courses for practicing physicians.

"Nobody wants to do away with the diagnostic X-ray," he said. "It is the unnecessary examination and those poorly performed by physicians, osteopaths, chiropractors, naturopaths, or even radiologists that are to be con-

demned." He denounced the situation that permits any practitioner without training or experience to obtain and use X-ray equipment for any examination he may choose.

Only the radiologists are certified specialists in this field and then only after 3 additional years of training and successful completion of examinations by the American Board of Radiology.

Reforms Proposed

He deplored situations which fail to provide protection to personnel and to those working in offices adjacent to the X-ray equipment with monitoring devices and sufficient radiation shielding in the walls and floors. They occur too commonly. He condemned routine fluoroscopy of infants and children and advised that X-ray pelvimetric examination of pregnant women should be used only when the indications are urgent, in view of the possible injury to the maternal gonads and the fetus. He also criticized health insurance plans which, by allowing \$25 worth of diagnostic X-rays each year, encourage unnecessary radiographic examinations and thus unnecessary radiation exposure. Careless and unscrupulous use of X-ray examinations, he said, is as reprehensible as fee-splitting and will be weeded out by courageous action by the medical profession.

The limits established for occupational exposure have been reduced progressively over the last 20 years.

Panel Summary

Summarizing the discussion of a panel of authorities on radiation hazards, Dr. Richard H. Chamberlain, University of Pennsylvania Hospital, Philadelphia, a member of the International Commission on Radiological Units, said:

"The well-known and generally accepted facts about radiation deserve frequent repetition. They have been the theme of national and international recommendations, of numerous contributions to scientific journals, and of our teaching.

"There has been some distortion and misplaced emphasis as to the extent of hazards in

If the Shoe Does Not Fit . . .

"The exposure of human beings to any unnecessary radiation is not to be encouraged; when no benefit can be expected, some exposures can be categorically forbidden. A situation of this type exists in the use of X-ray fluoroscopes for shoe-fitting, inasmuch as competent orthopedic authorities state that no benefit is to be achieved by their use in fitting shoes."

—RICHARD H. CHAMBERLAIN, M.D., *Journal of the American Medical Association*, October 3, 1953, p. 488.

medical radiation, but there has also been reasonable advice on some radiation precautions."

He summarized the familiar facts in somewhat the following form:

- Hazards of radiation are real.
- Dosage should be kept low.
- Education and experience are needed to appraise need of exposure and to control dose.
- Radiation techniques have been improved to reduce hazards.
- Radiological practice needs constant review and improvement.

Less familiar and newer points about radiology he mentioned were in essence:

- The lowest doses have some genetic effect, according to geneticists' estimates.
- Life shortening effects of radiation warrant consideration. Though not excessive, they cannot be ignored.
- Infants, children, and pregnant women should have more protection against radiation than older persons.

• Medical uses of radiation are increasing and are a public as well as a personal concern.

• The amount of population exposure is not known; its study must be comprehensive.

• Exposure to medical and dental radiation can be reduced without reducing diagnostic and therapeutic uses of radiation.

Conclusions based on the panel discussion included the following:

There is no disposition to abandon specific medical uses of radiology; rather, the needs and indications for each medical radiological procedure should be weighed against the hazards.

It has not been suggested that the total number of examinations is too high; increased use of radiological diagnosis is reasonably possible within a reduced total radiation exposure.

Provided they adhere to protective practices, radiologists and their associates need not have excessive concern for their longevity or injury.

It is not recommended that every individual carry a diary of exposure. Limited and controlled statistical studies, however, may well furnish needed scientific information for the future.

Exact values cannot yet be assigned to the precise individual risks of the absorption of a given amount of radiation in a specified volume of tissue. Even less attainable is a measured value for the beneficial returns associated with such exposure.

Dr. Chamberlain advised that radiation protection is less to be achieved "by legislation or rigid rules, by exhortation, or even fear," than by "the individual mind which employs wisdom, experience, and common sense."

Lauriston S. Taylor, chief of atomic and radiation physics in the National Bureau of Standards and chairman of the National Committee on Radiation Protection and Measurement, emphasized to the panel that most of the good advice necessary for protecting patients from unwarranted exposure in radiological diagnosis has been available for years, but some people have not been paying attention.

He summarized the essential information as follows:

The X-ray machine should be tested periodically for leakages and output. At least 2½ millimeters of aluminum should be used in order to "filter out" unnecessary radiation in diagnosis.

More efficient higher kilovoltage should be used with X-ray equipment, with lower milliamperes per second. This technique produces equivalent diagnostic X-ray films with less radiation for the patient.

Active chemicals and proper temperature should be used in the full-time development of films, so as to eliminate needless repeat studies.

Fluoroscopy, an X-ray technique that allows the doctor to see internal structures "in action," should be used to observe motion and function; the fluoroscope should not be used in screening.

The radiologist should adapt his eyes to darkness 20 minutes before fluoroscopy, and should always wear protective gloves and apron.

The equipment should have effective shutters which cut down to a minimum that part of the patient's anatomy under study; and in taking X-ray films, field-limiting cones and diaphragms should be used as much as possible.

Taylor's advice was elaborated by Dr. John S. Laughlin, Memorial Center, New York City, who also offered evidence of the degrees of exposure produced by various examinations. Dr. Laughlin reported measurements of bone marrow dose in chest examinations which indicated that photofluorography produced a bone marrow dose about that produced by natural background, and that chest radiography produced a bone marrow dose approximately 10 times less. (See table for estimates of gonadal and bone marrow dose received annually from natural background.)

"Subject always to the requirement of a film adequate for diagnosis, the following factors can result in appreciable reductions of patient exposure: Use of an adjustable diaphragm to obtain the smallest field size necessary; use of

Estimated annual dose from natural background

| Radiation source | Gonadal | | Bone marrow | |
|--------------------------|-----------|----------|-------------|----------|
| | Millirad | Millirem | Millirad | Millirem |
| Cosmic rays..... | 26 ± 3 | 26 ± 3 | 26 ± 3 | 26 ± 3 |
| Earth, housing..... | 53 ± 20 | 53 ± 20 | 59 ± 20 | 59 ± 20 |
| Atmospheric..... | 2 ± 1 | 2 ± 1 | | |
| Internal radioactivity: | | | | |
| Beta and gamma rays..... | 18 ± 3 | 18 ± 3 | 5 ± 1 | 5 ± 1 |
| Alpha particles..... | 0.5 ± 0.3 | 5 ± 3 | 4.5 ± 2 | 45 ± 20 |
| Total..... | | 104 ± 21 | | 135 ± 30 |

either heavy filtration or high voltage or both; use of scrotum shields or pelvic girdles; use of fast film and optimum developing chemicals and temperatures; and the use of image intensification where feasible," Dr. Laughlin emphasized.

Dose Measurement

Dr. Laughlin was concerned particularly with the complex problem of accurate measurement of dosage of radiation absorbed by the patient (fig. 1). "Because of the pronounced variation among different procedures of radiology," he said, "a given procedure cannot be represented by a single gonadal dose value which will have a general application. However, if one assumes that a range of valid gonadal dose values can be assigned to a given procedure for patients of a given age and sex and for different categories of practice, certain additional statistics are necessary to obtain an approximate estimate of the total gonadal dose." (A scientific exhibit at the meeting demonstrated the use of an electronic computer to determine dosage.)

Improved Equipment

Although the radiologist is moving in the direction of better diagnosis with less radiation exposure, by use of image amplifiers, fast developers, and sensitive film, Dr. Laughlin looked for industry to extend such developments by its own research.

The size of the field, that is, the extent of the anatomy undergoing examination, and the X-ray beam should be checked on all X-ray units to avoid exposure to irrelevant parts of the body, he cautioned. He recommended a lead-lined girdle to shield the patient's reproductive organs.

Several physicians commented on practical methods of reducing exposure.

An ultra-short timer is used to reduce exposure by Dr. Barton R. Young of Germantown Hospital, Philadelphia. It has a diagnostic advantage in angiocardiology, too, he said, because it catches the structure of the heart and opacified blood in motion, quite as a fast photograph stops or freezes rapid motion; and this is done with normal breathing and freedom from restraint of the patient. The ultra-fast

timer uses 1/1000th of a second in contrast to the usual period of 1/120th of a second.

An X-ray intensifying screen, utilizing thallium activated potassium iodide, was described by Dr. Michel Ter-Pogossian of Mallinckrodt Institute of Radiology, St. Louis. The screen reduces exposure by a factor of about four because of a more efficient utilization of the photon energy. It also permits a 50 percent reduction of the contrast material used in cerebral angiography.

Dental X-rays

One of the speakers said that the School of Dentistry at the University of California, by using high kilovoltage, small well-defined beams, long distance, and fast films, has been able to obtain a full-mouth examination by X-ray with an exposure of less than five roentgens (r) to the jaw. Currently, exposure for such a diagnosis can be as much as 300 r to the cheek and jaw. The School of Dentistry also uses a lead apron to shield patients under 30 years of age.

Vita Brevis?

With respect to the life expectancy of radiologists, Dr. Carl B. Braestrup of Frances Delafield Hospital, New York, noted that published reports of statistical studies related for the most part to physicians who practiced radiology when the hazards were great and the protective practices inferior to those today. Recent monitoring, he asserted, indicates that the average exposure to any major part of the radiologist's body today is well below the limit of 100 milliroentgens per week.

However, he said there is still need to improve safety practices related to fluoroscopy. He expressed the hope that new equipment would apply better protection at the source against secondary radiation.

For the present, safety depends mainly on shielding the person to be protected. Radiologists using unprotected equipment, he said, probably absorbed doses of the order of 100 r to the whole body in a year. With present standards, the yearly dose is reduced to 1 r, he estimated.

A different estimate was offered by Dr. Gioac-

chino Failla of New York City, who set the probable dose to a radiologist for 42 years, from age 18 to age 60, at 210 r, given modern protective methods. This much absorbed radiation, he estimated, would shorten life expectancy by about 8 months, in contrast to earlier studies which indicated that radiologists had a life about 5 years shorter than the average physician. An absorbed dose of one roentgen accumulated over a long period by the body as a whole, said Dr. Failla, shortens life by only 1 day, in contrast with earlier estimates of 15 days per roentgen.

He recommended, however, that radiologists should reduce their cumulative exposure to less than 210 r.

His remarks were limited to a discussion of chronic exposure at low dosage rates. Entirely different conclusions are drawn from studies of effects of large doses received in a short time. (An acute dose in the range of 400-500 r over the whole body results in death within 30 days to half of those so exposed. The life of the others exposed would be materially shortened.)

Genetic Defects

Apart from the effects on longevity, physicians should concern themselves with the effects of radiation on future generations, cautioned Dr. Bentley Glass of Johns Hopkins University, Baltimore.

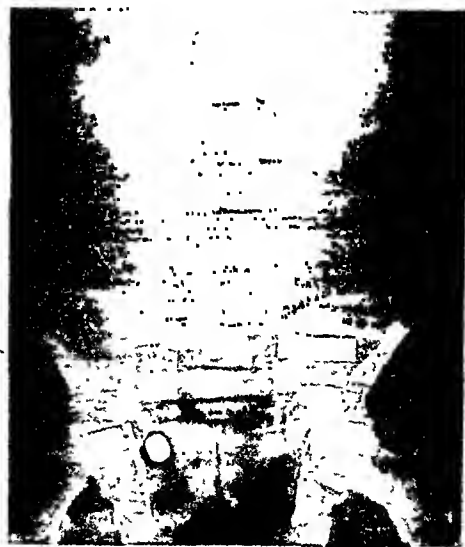
Any radiation absorbed by the gonads, he states, is likely to produce some effect on the descendants of those exposed. These effects are produced by changes of genes in the chromosomes which shape the anatomy and control the metabolism of the organism. Usually, a gene dies when it absorbs radiation, but those that survive, as mutations, are likely to be defective. Once in a population, the defect persists until the carriers fail to reproduce or it is excluded by chance from their progeny.

Typically, radiation-induced mutations produce no visible abnormality, even in the progeny, but only a slight reduction of life expectancy, a decrease in fertility, an increase in illness, and other nonspecific effects.

There is no sign, he said, that any dose will fail to produce such mutations. Even the



Figure 1. Sectioned phantom (left) of a young adult body is made of unit density pressed wood. It encloses an entire human skeleton which shows white in the radiograph (right). The absorptive character of the pressed wood and its beeswax and cork filling approximates that of skin, flesh, and musculature. The radiograph of the phantom shows the position of dosimeters at 3 points in the



skeleton. The dosimeters register approximately the amount of radiation that would be absorbed by the bone marrow given controlled amounts of external exposure to gamma radiation or X-ray. Experimental readings of this kind are used to compute how much of an external radiation dose is absorbed at various points or in strategic tissues within a living body.

either heavy filtration or high voltage or both; use of scrotum shields or pelvic girdles; use of fast film and optimum developing chemicals and temperatures; and the use of image intensification where feasible," Dr. Laughlin emphasized.

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stressed by Dr. Edith H. Quimby of New York City, who suggested that radiologists have a special competence to explain the subject to medical groups, hospital administrators, and civic organizations.

She urged physicians to bear in mind that the dose to the individual is less important than the average dose to the entire population in

the period between conception and the end of childbearing.

She added that radiation received by elderly persons is of no consequence whatsoever to the genetic problem and, further, that it may be important for future generations that some individuals have their troubles correctly diagnosed and treated effectively by radiation.

Radiation Dose Glossary

background Ever-present effects in physical apparatus above which a phenomenon must manifest itself in order to be measured. "Background" can take various forms, depending on the nature of the measurement. In electrical measurements of radioactivity and nuclear phenomena, the term usually refers to those undesired counts or currents that arise from cosmic rays, local contaminating radioactivity, insulator leakage, amplifier noise, power-line fluctuations, and so on. In nuclear work and photographic emulsions, the term refers to developable grains unrelated to the tracks under investigation.

curie, c 1. The present definition of the curie is: The unit of radioactivity defined as the quantity of any radioactive nuclide in which the number of disintegrations per second is 3.70×10^{10} .

2. An earlier definition of the curie was: The quantity (grams) of radon in equilibrium with 1 gram of radium.

dose (or dosage) (radiobiology) According to current usage, the radiation delivered to a specified area or volume or to the whole body. Units for dose specification are roentgens for X- or gamma rays, reps or equivalent roentgens for beta rays. The subject of dose units for particulate radiation and for very high energy X-rays has not been settled. In radiology the dose may be specified in air, on the skin, or at some depth beneath the surface; no statement of dose is complete without specification of location. The

entire question of radiation dosage units is under consideration by the International Congress of Radiology, and it is expected that new units based on the energy absorbed in tissue will be adopted.

dose, air (X-rays) (radiobiology) X-ray dose expressed in roentgens delivered to a point in free air. In radiologic practice it consists only of the radiation of the primary beam, and that scattered from surrounding air.

dose, cumulative The total dose resulting from repeated exposures to radiation of the same region, or of the whole body.

dose, depth The radiation dose delivered at a particular depth beneath the surface of the body. It is usually expressed as percentage of surface dose or as percentage of air dose.

dose, exit Dose of radiation at surface of body opposite to that on which the beam is incident.

dose, integral (or volume dose) A measure of the total energy absorbed by a patient or any object during exposure to radiation. According to British usage the integral dose for X- or gamma rays is expressed in gram-roentgens.

dose, median lethal (MLD) Dose of radiation required to kill, within a specified period, 50 percent of the individuals in a large group of animals or organisms.

dose, percentage depth Amount of radiation delivered at a specified depth in tissue, expressed as a percentage of the amount delivered at the skin, or as percentage of air dose.

dose, permissible (Supersedes the term tolerance dose. For detailed information, see National Bureau of Standards Handbook 59 and subsequent publications.)

dose, skin Dose at center of irradiation field on skin. It is the sum of the air dose and back scatter, with the addition of the exit dose from other parts, if this is significant.

dose, threshold The minimum dose that will produce a detectable degree of any given effect.

dose, tissue Dose received by a tissue in the region of interest. In the case of X-rays and gamma rays, tissue doses are expressed in roentgens. At the present time there is no generally accepted unit of tissue dose for other ionizing radiations. In radiobiological studies it is customary to think of the tissue dose in terms of the energy absorbed per gram of tissue. Several units related to the roentgen have been suggested, such as the rep (*see roentgen equivalent, physical*) and rad.

dose, tolerance A term based on the assumption that an individual can receive such a dose of radiation without any harmful effects. It is now superseded by permissible dose.

dose-effect curve A curve relating to the dose of radiation with the effect produced.

dose fractionation A method of administration of radiation in which relatively small doses are given daily or at longer intervals.

dose meter, dosimeter Any instrument which measures radiation dose.

dose meter, integrating Ionization chamber and measuring system de-

lowest doses produce mutations in proportion. And all doses to the gonads, from conception to the end of fertility, add to the total burden of mutations the population must carry.

Unlike spontaneous mutations, mutations produced by radiation are rarely if ever known to revert to the earlier form, he said.

The gonadal dose to the United States population per generation he estimated to be within a range of 1 to 8 r. This would mean that after 1,000 years, out of 4,000,000 babies born annually, there would be tangible genetic defects in from 1,000 to 64,000 (most probably 8,000). The probable figure, 8,000, is a 10 percent increase over the number of spontaneous defectives produced annually. In the first generation, he said, for a period of 30 years, the annual increment of defectives caused by radiation would most probably be 800.

Weighed in Balance

Such consequences of radiation exposure were balanced in the discussion against increases in life expectancy and improvements in medical practice, attributable in part to radiological diagnosis and therapy which has been increasing in application. The trend to increase use of radiological diagnosis and therapy is illustrated in figure 2.

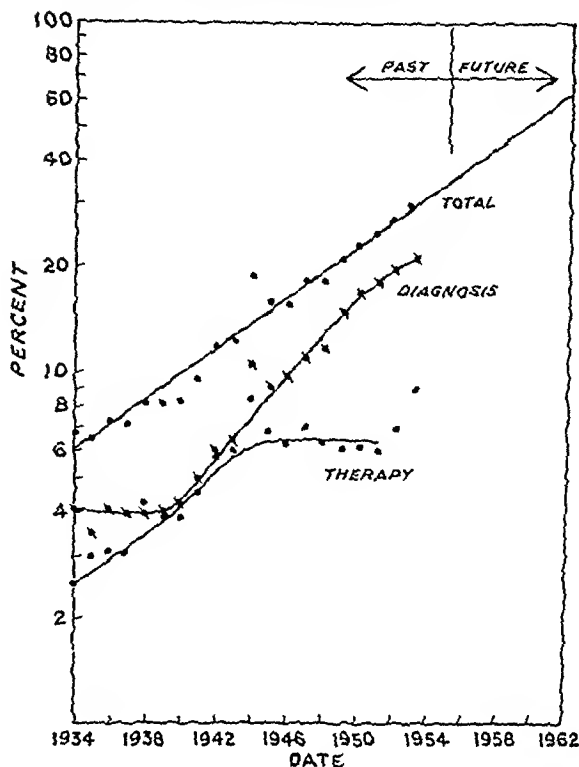
The genetic hazard was viewed in the perspective of a decline in infant mortality from 99.9 per 1,000 live births in 1915 to 26.4 in 1955. Radiation hazards were contrasted with motor vehicle accidents which cost 38,426 lives in the United States in 1955.

At the same time, speakers urged proper use of radiological terms. Too often, it was said, statements about exposure make no reference to the numbers, kinds, or volumes of tissues exposed.

In avoiding unwarranted exposure of a patient to medical radiation, it was agreed, the physician must be aware of the risks, so that he will ask whether there is a way of reaching a correct diagnosis other than by X-ray, especially when the patients concerned are children, pregnant women, women in the child-bearing period, and men under 40.

In criticism of the fluoroscopic examination of well babies on their periodic visits to their

Figure 2. Percentage of hospital and clinic patients using radiological services, University of California Medical Center.



pediatricians, it was said that such examinations include, almost as a routine, direct exposure of the gonads, and frequently the physician does not know the rate of exposure of the machine.

Pelvic examination was said to contribute as much as 20 percent of the genetically significant radiation in the population. Such examinations expose to radiation the gonads of the mother and child and, in early pregnancy, may affect the embryo. "They should not be done unless there is a threat to the health of the patient," one speaker stated. "If a pelvic study is necessary in the opinion of the obstetrician, it should be done late in pregnancy when the fetus is beyond the period of organogenesis, and when a comparison can be made of the fetal head size to pelvic size."

Groundless Fears

The need for physicians to relieve the public of groundless fears about radiation was

An assay of thyroids from livestock indicates that radioactive iodine is accumulated and readily detectable in these glands following nuclear weapons testing. The levels found are an index of fission product contamination in the area.

Radioactivity in Animal Thyroid Glands

ARTHUR H. WOLFF, D.V.M.

A STUDY of radioactivity in animal thyroid glands was conducted to determine the feasibility of this technique in monitoring the environment for radioactive fallout. Thyroid glands of 412 animals from four States were assayed for evidence of fresh fission products from nuclear weapons testing which the United States began in the Pacific, May 5, 1956.

There are several radioisotopes of iodine which contribute significantly to the mixture of early gross fission products (1). Of these iodine-131 has the longest half-life—about 8 days—and it is the iodine isotope of most concern biologically. Radioactive isotopes of iodine assimilated by animal or man behave biologically just like the naturally occurring stable isotope of iodine and concentrate in the thyroid gland. If animals eat a gross mixture of fission products less than several weeks old, a significant portion of the I^{131} present would be concentrated in a small volume of thyroid tissue and would be readily detectable with appropriate instruments.

Thyroid concentration of fission-produced radioiodine may be associated not only with fallout from nuclear weapons tests but also with fission product waste from nuclear reactors. Hanson and Browning have found I^{131} in the thyroids of indigenous jackrabbits associated

with stack discharge of radioactive wastes at the Hanford Atomic Products Operation (2). They have collected data since 1951, trying to derive ratios between concentrations of I^{131} in rabbit thyroids and the waste emission rate from the Hanford plant.

In 1953, I assayed thyroids from 10 sheep originating in 6 herds near Cedar City, Utah, and found concentrations averaging about 0.6 microcurie I^{131} per gram of thyroid tissue at the time of autopsy. There was evidence that these sheep had assimilated fission products falling out from a Nevada "shot" 2 or 3 weeks prior to the autopsy (3).

Since that time, other investigators have reported radioactive iodine in animal thyroids (4-7). The activity presumably was associated with nuclear weapons testing in all instances.

Methods

Single or partial lobes of thyroid glands from animals obtained between April 14 and October 18, 1956, were received in 10 percent formalin solution from Arizona, Ohio, Oregon, and Pennsylvania.

The specimens were individually prepared for beta counting. Each lobe or partial lobe initially was blotted, and, generally, a 1-gram portion from each specimen was placed in an individual flask to which a few drops of sodium iodide solution (20 mg. of iodide per ml.) and 5 ml. of 0.5 normal sodium hydroxide were

Dr. Wolff is senior veterinarian with the Radiological Health Medical Program, Division of Special Health Services, Public Health Service.

signed for determining total radiation administered during an exposure. In medical radiology the chamber is usually designed to be placed on the patient's skin. A device may be included to terminate the exposure when it has reached a desired value.

dose protraction A method of administration of radiation by delivering it continuously over a relatively long period at a low dosage rate.

dose rate, dosage rate Radiation dose delivered per unit time.

dose rate meter Any instrument which measures radiation dose rate.

exposure Condition of being in the path of radiations (*see dose*).

exposure, acute (radiobiology) Radiation exposure of short duration.

exposure, chronic (radiobiology) Radiation exposure of long duration, by fractionation or protraction.

milliroentgen One-thousandth of a roentgen.

rad One hundred ergs of absorbed energy per gram of absorbing material.

roentgen, r The quantity of X- or gamma radiation such that the associated corpuscular emission per 0.001293 grams of air produces, in air, ions carrying 1 esu of electricity of either sign. Associated corpuscular emission is the full complement of secondary charged particles (usually limited to electrons) associated with an X-ray or gamma ray beam in its passage through matter.

roentgen equivalent, man (rem) The dose of any ionizing radiation that will produce the same biological effect as that produced by 1 roent-

gen of high voltage X-radiation. (A proposed unit, Parker.)

roentgen equivalent, physical (rep) A unit proposed to apply to statements of dose of ionizing radiation not covered by the definition of the roentgen. It has been variously defined as the dose which produces energy absorption of 83 ergs per gram of tissue or 93 ergs per gram of tissue. The actual energy absorption in tissue per roentgen is a function of the tissue composition and of the wavelength of the radiation, and ranges between 60 and 100 ergs per gram.

SOURCE: *A Glossary of Terms in Nuclear Science and Technology (ASA N1.1-1957 UDC 001.4:539) of National Research Council Conference. Published by the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.*

Course in Public Health Problems of Radiation

A course in public health aspects of radiation will be conducted by the Radiological Health Medical Program, Public Health Service, January 13-24, and repeated May 13-24, 1958, in Washington, D. C. The course is designed for medical, dental, and biological personnel of Federal, State, and local health agencies, who are concerned with radiological health but who are without formal training in this field.

With the objective of preparing trainees for program planning, the course will cover:

- The various applications of nuclear energy and radiation, stressing their public health implications.
- The biological effects of radiation, particularly long-term effects, such as carcinogenesis, mutation, and lifespan shortening.
- The philosophy and procedures related to radiation protection and practical methods of reducing exposure from medical and dental X-rays to patient as well as to operators.
- Potential administrative problems in setting up radiological health programs, and the status of related legislative and regulatory procedures.

Applications and further information may be obtained from the Chief, Radiological Health Medical Program, Division of Special Health Services, Public Health Service, Washington 25, D. C.

gon specimens undoubtedly are lower than the actual values, since we were not able to determine the date of slaughter for most of the samples submitted from this State. The Oregon activity, therefore, was extrapolated to the date of mailing in instances of unspecified slaughter dates. Some of the specimens were shipped as much as 2 to 3 weeks following the date of collection.

Van Middlesworth has reported that sheep tend to concentrate greater amounts of I^{131} in the thyroid than do cattle (4). The limited data presented here tend to substantiate this observation when the mean levels of activity of the two species are compared during the same period and within the same State. The data for Oregon sheep and cattle during the last period would indicate the opposite. However, the quantitative significance of these data is questionable because, as previously pointed out, the slaughter dates and the proper extrapolation factors for these specimens are not known.

For the most part the specimens from Pennsylvania showed less activity than those from the other States. The livestock thyroids from

this State originated in a veterinary diagnostic laboratory, and most of the source animals were moribund or dead when received by the laboratory, in contrast with the presumably healthy grazing animals serving as a source of thyroids in the other States. This is offered as a possible reason for the difference in activity.

Although I^{131} was readily detectable in thyroids of animals from widely varied locations after May 16, the estimated doses in the thyroid were quite low. The mean concentration of I^{131} in cattle thyroids in Ohio and Arizona, based on the combined data of these two States, from May 16 through October 18 was about 0.5 m μ c./gm. The mean concentration for sheep in these same States was about 1.7 m μ c./gm. If we assume that these mean values represent the average daily sustained concentrations of I^{131} , we can estimate the total integrated dose during the 150-day period of this study to be about 910 millirep (milliroentgens equivalent physical) and 3,100 millirep for cattle and sheep respectively. Stated in another manner, the average weekly thyroid dose would have been about 42 millirep per week and 144

Table 1. Average concentration of iodine-131 from 331 livestock thyroid glands, April 24 through October 18, 1956

| Period and State | Cattle | | Sheep | | Other animal | |
|-----------------------------------|---------------------|----------------------------|---------------------|----------------------------|---------------------|----------------------------|
| | Number of specimens | Mean activity ¹ | Number of specimens | Mean activity ¹ | Number of specimens | Mean activity ¹ |
| <i>Apr 24-May 15 (pre-series)</i> | | | | | | |
| Arizona | 21 | (2) | 15 | (2) | 0 | |
| Ohio | 12 | 0.0041 | 0 | ---- | 0 | ---- |
| Oregon | 0 | | 0 | ---- | 0 | ---- |
| Pennsylvania | 7 | (2) | 1 | (2) | 1 | (2) |
| Total | 40 | 0.008 | 16 | (2) | 4 | (2) |
| <i>May 16-Aug 15</i> | | | | | | |
| Arizona | 36 | 25 | 9 | 2.70 | 0 | |
| Ohio | 46 | 58 | 31 | 1.37 | 9 | 0.16 |
| Oregon | 24 | 11 | 19 | .33 | 0 | |
| Pennsylvania | 8 | 14 | 5 | .20 | 16 | .067 |
| Total | 114 | .34 | 67 | 1.17 | 25 | .21 |
| <i>Aug 16-Oct 18</i> | | | | | | |
| Arizona | 12 | 28 | 3 | 2.15 | 0 | |
| Ohio | 11 | 80 | 0 | | 0 | |
| Oregon | 18 | 30 | 18 | .12 | 0 | |
| Pennsylvania | 0 | | 0 | | 0 | |
| Total | 44 | 45 | 21 | .11 | 0 | |

¹ Activity is in millimicrocuries per gram of thyroid extrapolated to date of slaughter.

² Background or activity below limit of sensitivity (0.01 m μ c./gm.).

added. The flasks were gently heated, usually 1 to 2 hours, until digestion was complete. Each digest was transferred to a stainless steel planchet cup (2" by $\frac{3}{16}$ ") and thoroughly dried by infrared heating. The radioactivity of the residue in the cups then was counted in an alpha, beta, gamma, proportional counter (NMC Model PC-1). Activity, after the required corrections, was expressed as millimicrocuries (m μ c.) per gram of wet (formalized) tissue, extrapolated to the date of slaughter or death of the animal. Preliminary studies indicated that the weight of thyroids after soaking in 10 percent formalin for several days was about 10 percent greater than fresh weight. The more active samples were checked periodically for decay, substantiating a half-life of about 8 days.

Specimens with an activity greater than 0.05 m μ c./gm. were counted with a standard deviation of less than 10 percent. Those having activity of less than 0.05 m μ c./gm. were counted with a standard deviation ranging from 10 to 50 percent. The lower limit of detection was 0.01 m μ c./gm. \pm 50 percent.

Results and Discussion

Of the specimens received, 81 were from small animals, mostly dogs and cats undergoing post-mortem examination in veterinary clinics in Ohio and Pennsylvania, and 331 were from livestock, mostly cattle and sheep. Pennsylvania livestock specimens came from the diagnostic laboratory, New Bolton Center, University of Pennsylvania Veterinary School. All other livestock thyroids came from slaughterhouses in Phoenix, Ariz., Columbus and Cincinnati, Ohio, and Portland, Oreg.

All thyroids from animals dying between April 14 and May 16, 1956, were considered pre-series specimens, thus arbitrarily allowing 11 days after the announced start of the United States Pacific test series for the occurrence of fallout in the United States and the assimilation of I^{131} by animals.

No I^{131} was detected in 33 pre-series thyroids from small animals. From the thyroids of 45 small animals dying between May 16 and the end of July, I^{131} was detected in only one thyroid: there was 0.04 m μ c./gm. in a specimen from a cat in Pennsylvania.

It is thought that any activity found in small animal thyroids would be mainly attributable to inhalation and, to a minor extent, dietary intake, depending on the quantity of fresh milk consumed. Milk, as a possible vehicle for I^{131} , is discussed later in this report. The sensitivity of the equipment available for this study probably was too limited (0.01 ± 50 percent m μ c./gm.) to detect the low levels of activity expected in small animals in contrast with the expected concentrations assimilated by grazing animals. Livestock may graze daily many hundreds of square feet of pasture which serves as an efficient collector of fallout. On the basis of a report by Chamberlain (8) it is estimated that in an area with a given sustained atmospheric concentration of I^{131} , the thyroid I^{131} uptake by cattle as a result of grazing in the area would be several thousand times greater than what could be attributed to inhalation alone.

As anticipated, the thyroids from livestock revealed much more activity than those from nongrazing small animals. The total number of livestock specimens assayed during select sampling periods and the corresponding number in which activity was detected are summarized below.

| Period | Number of livestock specimens | Number with detectable I^{131} activity |
|-----------------------------|-------------------------------|---|
| Pre-series | 60 | 2 |
| May 16-June 15..... | 70 | 27 |
| June 16-July 30..... | 89 | 65 |
| August 1-August 31..... | 102 | 92 |
| September 1-October 18..... | 10 | 10 |

A progressive increase in the proportion of livestock thyroids with detectable activity is apparent following the onset of the United States tests in the Pacific. In view of the announced July 23 terminal date of these tests and the announcement of a Russian test series beginning on August 24, the activity in the last 10 specimens is thought to be associated with the Russian series.

Table 1 summarizes the numbers of thyroid specimens tested and the mean concentrations of I^{131} detected, according to the species, geographic origin, and period of collection. Table 2 summarizes the distribution of the individual samples with respect to the levels of activity according to period and species.

The indicated levels of activity for the Ore-

The levels of animal thyroid activity in this study, though readily detectable, occurred for the most part in the absence of significant increases in gamma background and air activity as reported weekly by the Nationwide Radiation Surveillance Network (19). It is conceivable that for limited periods levels of fission product activity in milk could approach peacetime permissible levels with little or no perceptible increase in background levels (16).

Summary

Iodine-131 activity was readily found in thyroid glands from grazing animals in Arizona, Pennsylvania, Ohio, and Oregon within 2 weeks following the start of the 1956 United States Pacific atomic weapons tests. A progressive increase was noted in the proportion of samples which were active from mid-May to mid-October, at which time the study was terminated.

Based on the Arizona and Ohio data, the average weekly dosages from mid-May to mid-October to cattle and sheep were 35 and 120 millirep respectively, apparently harmless to the health of animals. It is suggested that the average cattle I^{131} level found in this study approximates the average continuously existing in United States cattle during the past 2 or 3 years.

Theoretical considerations indicate that with the levels of I^{131} found in cattle thyroids, detectable amounts of I^{131} would have been secreted with the fresh milk produced in these areas.

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Table 2. Distribution of iodine-131 concentration in livestock thyroids from Arizona, Ohio, Oregon, and Pennsylvania, April 24 through October 18, 1956

| Period and species | Mean activity (m μ c./gm.) | Highest activity (m μ c./gm.) | Number of thyroid specimens | | | | |
|------------------------------------|-----------------------------------|--------------------------------------|-----------------------------|----------------------------|---------------------------|--------------------------|-------|
| | | | Back-ground | 0.01-0.1 m μ c./gm. | 0.1-1.0 m μ c./gm. | 1.0-10 m μ c./gm. | Total |
| <i>Apr. 24-May 15 (pre-series)</i> | | | | | | | |
| Cattle----- | 0.0008 | 0.03 | 38 | 2 | 0 | 0 | 40 |
| Sheep----- | (¹) | (¹) | 16 | 0 | 0 | 0 | 16 |
| Other----- | (¹) | (¹) | 4 | 0 | 0 | 0 | 4 |
| Total----- | | | 58 | 2 | 0 | 0 | 60 |
| <i>May 16-Aug. 16</i> | | | | | | | |
| Cattle----- | .34 | 2.5 | 53 | 19 | 27 | 15 | 114 |
| Sheep----- | 1.17 | 5.3 | 12 | 1 | 34 | 20 | 67 |
| Other----- | .21 | .87 | 6 | 6 | 13 | 0 | 25 |
| Total----- | | | 71 | 26 | 74 | 35 | 206 |
| <i>Aug. 16-Oct. 18²</i> | | | | | | | |
| Cattle----- | .45 | 4.20 | 6 | 11 | 20 | 7 | 44 |
| Sheep----- | .41 | 2.50 | 1 | 6 | 11 | 3 | 21 |
| Total----- | | | 7 | 17 | 31 | 10 | 65 |

¹ Background or activity below limit of sensitivity (0.01 m μ c./gm. \pm 50 percent).

² Only cattle and sheep were assayed in this period.

millirep per week for cattle and sheep during the period of May 16 through October 18, 1956.

These values are in general agreement with the dosage levels reported in similar studies (4-7). These exposure levels are apparently harmless for livestock and probably would represent no acute hazard to animals even if exceeded by 1 or 2 orders of magnitude (9).

Van Middlesworth, since November 1954, has been conducting an extensive sampling program, testing 15 thyroids a week from cattle raised in the Memphis area (4). The mean weekly concentration of I¹³¹ found in these cattle for a 70-week sampling period was about 0.9 m μ c./gm. If we can assume that these data, along with the Ohio and Arizona data given here, are representative of the rest of the country, we can estimate that the average concentration of I¹³¹ in cattle thyroids has been at least 0.5 m μ c./gm., resulting in an average cattle thyroid dose of at least 42 millirep per week over the last 2 to 3 years.

Generally, it is accepted that body burden levels of radioisotopes found in grazing animals will be many times greater than those likely to be present among the adult human population in the same area. Comar found the I¹³¹ content in animal thyroids to be 16 to 85 times that

found in humans in the same locale (7). Van Middlesworth reported maximum I¹³¹ activity in cattle to be 200 times the maximum activity in humans in the same area (4).

Thus, if cattle have been subjected to thyroid exposure levels in the order of 42 millirep per week, it appears that the general population has been subjected to considerably less. However, it should be pointed out that the thyroid dosage received by infants and young children may be considerably higher than that by adults because significant portions of I¹³¹ ingested by dairy cows will be secreted with the milk (10, 11).

According to data of Hunter and Ballou (1), limited evidence (12-15), and theoretical considerations (16), significant levels of various other fission product radioisotopes would be secreted into milk concomitantly with I¹³¹. Although there has been extensive investigation (17-18) with respect to the levels of the long-life alkaline earth, strontium-90, in milk, human bones, and other biological material, to my knowledge there has been but limited investigation of the relative contribution of other fission products, particularly some of the shorter-lived radioelements, via the nutritional medium of milk.

Characteristics and Professional Staff of Outpatient Psychiatric Clinics

OUTPATIENT psychiatric clinics today provide an important segment of the total psychiatric services in communities throughout the country. Nationwide data on these facilities and the patients they serve are reported annually to the National Institute of Mental Health, Public Health Service, through a program initiated in 1954 with the cooperation of State mental health authorities and professional groups. Data on characteristics of clinics and their professional staff are summarized in Public Health Monograph No. 49.

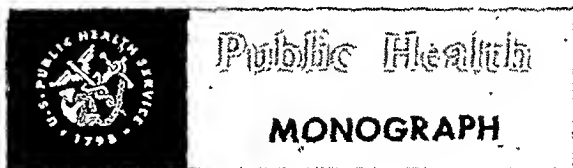
Outpatient psychiatric clinics are defined as facilities "where a psychiatrist is in attendance at regularly scheduled hours and takes the medical responsibility for all of the patients in the clinic."

In 1954-55, these clinics, operating under a variety of governmental and nongovernmental auspices to provide services to children and adults seeking or referred for psychiatric services, numbered 1,234. Approximately half of all outpatient psychiatric clinics were full time (open 35 hours or more a week). Part-time clinics included a number of clinic teams traveling under State governmental auspices to provide a minimum of regularly scheduled service in less populated areas where there were no other psychiatric services.

Although clinics were located in all but one State, there was considerable geographic disparity in the number of clinic professional man-hours of service per 100,000 population. States in the Northeast tended to have relatively high ratios of professional man-hours to population; States in the South, low ratios. There were relatively few clinic facilities in semirural and rural areas compared with the number of clinic facilities in large cities. An important factor in the geographic imbalance

of clinic services was the concentration in urban areas of medical and other professional training facilities.

Two-fifths of the total clinic professional man-hours of service reported were provided



No. 49

The accompanying summary covers the principal findings presented in Public Health Monograph No. 49, published concurrently with this issue of Public Health Reports. The authors are with the Biometrics Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Radiation Protection in Industry



In interactions between advisory and official groups toward effecting the protection of workers against radiation hazards in industry, it is the employer who must provide the means for protection.

For the employer to have knowledge of the extent of potential radiation hazards, and for their proper evaluation, a chain of communication must be established between him and the manufacturer of a radiation source. The communication line, for other reasons, should extend to operators, to other employees, and perhaps to the public. Certainly the employees of an official agency having jurisdiction over protection practices must know that a hazard is present.

Registration of radiation sources is based upon the need to know where radiation hazards are present in industry. Connecticut, Delaware, New York (both health and labor departments), North Dakota, Pennsylvania, South Dakota, Texas, and Wisconsin require registration of radiation sources. The very act of registering a source provides a stimulus for conscious recognition of radiation hazards and their control by the employer.

We cannot, however, register all radioactive materials; our own bodies contain some amounts. And there is general acceptance that certain radiation sources containing measurable amounts of radioactive materials (such as

radium dial wrist watches) may be allowed in general commerce without tight regulations. Large numbers of such items, on the other hand, in collecting points may bring into one spot enough radioactive materials to produce a hazard.

These quantities must be labeled. The pictured radiation hazard warning symbol—a purple, three-bladed “propeller” on a yellow background—has been adopted by the Atomic Energy Commission and several States.

Attempts are being made to standardize radiation protection in manufactured items and operations in industry. Standard shielding, installation, and maintenance will be the same for the strontium-90 thickness gauge wherever it may be located. Standards are being developed to apply to dental X-ray units, radioisotopic radiographs, and radium static electricity eliminators. The American Standards Association is developing standards aimed at the manufacture of sealed beta ray sources, and perhaps even “mass-produced” nuclear reactors, so that the hazard picture associated with any one unit can be repetitively characterized.

—*Excerpts from an address presented by Saul J. Harris, assistant manager of technical services, Atomic Industrial Forum, Inc., at the Sixth Annual Health Conference of the Pennsylvania Department of Health, Aug. 21, 1957.*

quirement of one full-time clinic per 100,000 population. Only the District of Columbia, New York, and Massachusetts, all psychiatric training centers, provided the equivalent of two full-time clinics per 100,000 population. Even in these States, long waiting lists for clinic service reflect the unmet needs related to a dense metropolitan population, services to nonresidents, and considerable training activities.

On the basis of projected civilian population growth, the number of outpatient psychiatric clinic staff will have to be increased 50 percent to meet a minimum requirement of one full-time clinic (140 man-hours of service) per 100,000 population by 1965, or tripled if two full-time clinics per 100,000 population is established as a minimum goal.

Areas requiring additional research and planning include—

- Ways of increasing the total supply of professional personnel trained in accredited schools and, at the same time, effecting a more balanced geographic distribution of professional resources.

- Morbidity studies to determine the total number of mentally ill persons in the country and in various communities, by age, sex, and psychiatric disorder.

- Development of guides for determining the need for and ways of providing more adequate clinic service in sparsely populated and highly urban areas.

- Development of "ideal" patterns of mental health service in communities as guides, including clarification of the role of the various psychiatric agencies and of other mental health facilities, such as family service agencies, counseling centers, schools, local health departments, and general practitioners.

- Reexamination of the responsibilities of each professional staff member toward child and adult patients in light of the advances being made in professional education and training and in psychodynamics, the possible changes that may occur as a result of the widespread use of tranquilizing drugs, and the general shortage of professional personnel.

Reginald M. Atwater, 1892–1957

Dr. Reginald M. Atwater, executive secretary of the American Public Health Association, died October 18, 1957. At the time of his death, Dr. Atwater was also managing editor of the *American Journal of Public Health*, as well as special consultant to the Public Health Service and a board member of the National Health Council. Before becoming executive secretary of the association in 1935, he was commissioner of health of Cattaraugus County in New York for 8 years.

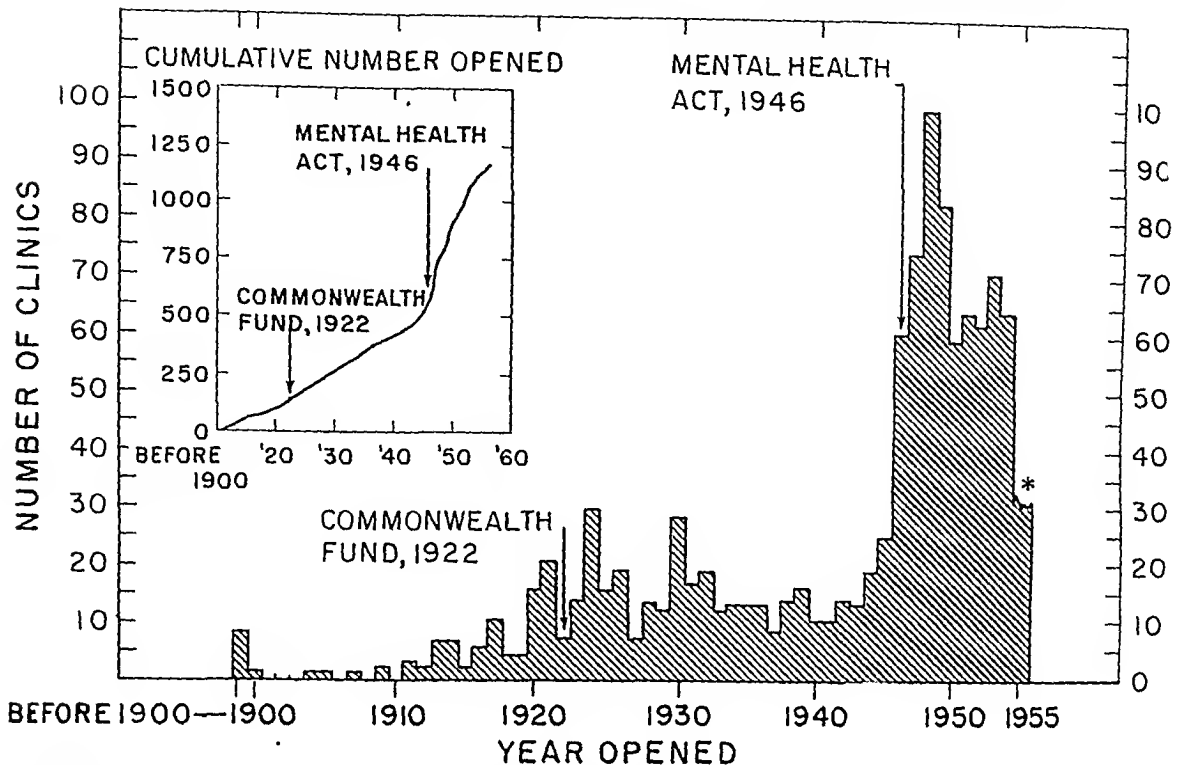
Under the auspices of the Yale in China organization, Dr. Atwater served as associate professor of preventive medicine and public health in the Hunan Yale College of Medicine, Chungsha, China, from 1921 to 1925. On his return to the United States, he joined the faculty of Harvard Medical School and the School of Public Health, where he taught preventive

medicine and epidemiology and conducted research on pneumonia and rheumatic fever.

A graduate of Harvard Medical School, Dr. Atwater was a Rockefeller Foundation fellow in public health and in 1920 and 1921 took the degrees of master and doctor of public health at Johns Hopkins University School of Hygiene and Public Health.

In 1939, Dr. Atwater received the Order of Carlos J. Finlay from the Cuban Government. Ten years later he was awarded an honorary degree by Colorado College. He also received the Sedgwick Memorial Medal of the American Public Health Association and was made an honorary fellow of the Society of Medical Officers of Health in Great Britain in 1952. In 1957, he became an honorary associate fellow of the American Academy of Pediatrics.

Number of outpatient psychiatric clinics, by year opened, United States, 1954-55.



SOURCE: Data based on reports from 1,140 of the 1,234 outpatient psychiatric clinics in the United States, 1954-55.

*Incomplete data.

by 688 clinics serving both children and adults; two-fifths by 381 clinics offering diagnostic and treatment services for children only, usually including some collateral service with their parents; and one-fifth in 136 clinics serving adults exclusively. In about a fourth of all mental health clinics, service was limited either to selected diagnostic groups of persons, such as discharged mental hospital patients, alcoholics, mentally retarded persons, epileptics, and juvenile delinquents, or to other special eligible groups—veterans, students, or court cases.

A total of 9,500 professional staff were employed in outpatient psychiatric clinics throughout the country; 90 percent were psychiatrists, clinical psychologists, and psychiatric social workers—members of professions which traditionally provide the skills coordinated in the outpatient psychiatric clinic. Seventy percent of all clinics had personnel from each of these three disciplines. A small num-

ber of pediatricians, internists, nurses, and occupational and remedial therapists were employed in specialized clinics. Of the 9,500 professional staff, less than one-third were regular full-time employees, half were part-time employees, and one-fifth were trainees. Due to the high proportion of part-time psychiatrists and other professionals, the 9,500 professional employees represented the equivalent services of less than 5,400 full-time persons.

The professional staff provided an average of 115 man-hours of clinic service per week for each 100,000 population. If it is assumed that a full-time clinic is staffed by a team comprised of a psychiatrist, a clinical psychologist, a psychiatric social worker, and either an additional psychiatric social worker or other professional person, providing a total of 140 man-hours of service per week, only 9 States (District of Columbia, New York, Massachusetts, Kansas, Connecticut, Illinois, Delaware, Rhode Island, and Hawaii) met a hypothetical minimum re-

Engineering degrees awarded in 1956 to persons with sanitary engineering training, United States

| Institution | Doc- tor's | Mas- ter's | Bache- lor's | Institution | Doc- tor's | Mas- ter's | Bache- lor's |
|--|----------------|-----------------|-----------------|--|---------------|-----------------|-----------------|
| Alabama Polytechnic Institute..... | | 0 | 2 | Missouri, University of..... | | 0 | 5 |
| Alabama, University of..... | | 0 | 0 | Nebraska, University of..... | | 0 | |
| Arizona, University of..... | | | 0 | New Hampshire, University of..... | | 0 | |
| Arkansas, University of..... | | 1 | | Newark College of Engineering..... | | 3 | 5 |
| California Institute of Tech- nology..... | 0 | ¹ 3 | | New Mexico College of Agricul- tural and Mechanical Arts..... | | 0 | 0 |
| California, University of..... | 2 | ¹ 10 | 5 | New York University..... | 1 | ¹ 11 | 12 |
| California, University of South- ern..... | | | 0 | North Carolina State College..... | | 2 | |
| Case Institute of Technology..... | | 0 | | North Carolina, University of..... | | ¹ 6 | |
| Cincinnati, University of..... | | 0 | | North Dakota, University of..... | | 0 | 0 |
| Clemson Agricultural College..... | | | 6 | Northwestern University..... | | 2 | |
| College of Agricultural and Me- chanical Arts, Puerto Rico..... | | | 0 | Northwestern Technological In- stitute..... | 0 | ¹ 3 | |
| Colorado, University of..... | | 1 | 4 | Ohio State University..... | 0 | ¹ 0 | 0 |
| Connecticut, University of..... | | 0 | | Oklahoma Agricultural and Me- chanical College..... | 0 | ¹ 1 | 2 |
| Cornell University..... | 1 | 0 | 0 | Oklahoma, University of..... | | ¹ 4 | 0 |
| Florida, University of..... | 0 | 2 | 2 | Oregon State College..... | 0 | 1 | |
| George Washington University..... | | | 0 | Pennsylvania State University..... | 0 | ¹ 2 | 12 |
| Georgia Institute of Technology..... | | 0 | ¹ 10 | Polytechnic Institute of Brooklyn..... | | 0 | 0 |
| Harvard University..... | 1 | ¹ 11 | 0 | Purdue University..... | 0 | ¹ 2 | 5 |
| Idaho, University of..... | | 0 | | Rensselaer Polytechnic Institute..... | | 0 | 8 |
| Illinois Institute of Technology..... | 0 | 0 | | Rhode Island, University of..... | | 0 | |
| Illinois, University of..... | | ¹ 4 | 2 | Rutgers University..... | | 2 | 3 |
| Iowa State College..... | 0 | 2 | 2 | South Dakota State College..... | | 0 | 1 |
| Iowa, State University of..... | | ¹ 3 | 2 | Southern California, University of..... | | 1 | |
| Johns Hopkins University..... | ¹ 1 | ¹ 5 | | Southern Methodist University..... | | ¹ 1 | |
| Kansas State College..... | | | 29 | Stanford University..... | | | 0 |
| Kansas, University of..... | | 0 | 2 | Tennessee, University of..... | | 0 | |
| Kentucky, University of..... | | 0 | | Texas, Agricultural and Mechan- ical College of..... | 0 | 0 | |
| Lehigh University..... | | | 0 | Texas Technological College..... | | 0 | 2 |
| Maine, University of..... | | 0 | 2 | Texas, University of..... | 0 | 2 | 0 |
| Manhattan College..... | | | 16 | Tulane University of Louisiana..... | | 0 | 0 |
| Marquette University..... | | | 0 | Utah, University of..... | | 0 | |
| Massachusetts Institute of Tech- nology..... | 2 | ¹ 15 | 3 | Virginia Polytechnic Institute..... | 0 | 5 | 34 |
| Massachusetts, University of..... | | 0 | 0 | Washington, State College of..... | | ¹ 2 | 2 |
| Michigan State College..... | 0 | 1 | | Washington University..... | | 0 | |
| Michigan College of Mining and Technology..... | | 0 | 5 | Washington, University of..... | 0 | 1 | 0 |
| Michigan, University of..... | 0 | 12 | 0 | West Virginia University..... | | 0 | 1 |
| Minnesota, University of..... | 0 | ¹ 2 | 0 | Wisconsin, University of..... | 1 | 1 | 8 |
| Mississippi State College..... | | 0 | 12 | Wyoming, University of..... | | 0 | |
| Missouri School of Mines and Metallurgy..... | | 0 | 4 | Total..... | 9 | 124 | 208 |

¹ Includes foreign nationals.

Leaders (.....) indicate no courses offered at this level.

Sanitary Engineering Graduate Degrees Awarded in 1956

FREDERICK K. ERICKSON, S.M.,
and FRANK A. BUTRICO, M.S.S.E.

IN the academic year 1955-56, 133 graduate degrees were conferred in the United States in the field of sanitary engineering, 12 fewer than in 1954-55. Of this total, 124 were master's and 9 doctor's degrees, granted in August 1955, February 1956, and June 1956. A total of 208 completed undergraduate sanitary engineering courses.

Institutions conferring sanitary engineering degrees are listed in the accompanying table with the number of degrees conferred. A list of all schools offering such training is available from the authors. Similar data for the period since 1889 are available in the literature (1-3) or have been distributed by the Public Health Service.

Undergraduate Degrees

Undergraduate sanitary engineering training was offered by 53 institutions. Of these, 32 reported graduates who had received "undergraduate training toward the bachelor's degree in sanitary engineering or with sanitary engineering major or option." For the academic years 1952-53, 1953-54, and 1954-55, the number of undergraduate degrees were 216, 164, and 141, respectively. The bulk of the increase during 1955-56 over the previous academic year is represented by two schools reporting a total of 63 graduates this year but which reported none in the 1954-55 survey.

Mr. Erickson is sanitary engineer director, and Mr. Butrico is chief, Office of Engineering Resources, Division of Sanitary Engineering Services, Public Health Service.

The average number of graduates per year for the previous 10-year period 1946-55 was 181 and for the 5-year period 1951-55, it was 196.

Master's Degrees

Of the 124 master's degrees awarded in the 1955-56 academic year, 93 were awarded to citizens of the United States, a decrease of 7 percent from the number in 1954-55. Graduate sanitary engineering training at the master's level was available in 67 universities or colleges, of which 34 reported no such degrees awarded this year. For the academic years 1952-53, 1953-54, and 1954-55, the numbers of master's degrees awarded were 102 (20 to foreign nationals), 120 (25 to foreign nationals), and 134 (34 to foreign nationals). The average number of master's degrees conferred per year for the 10-year period 1946-55 was 126, and for the 5-year period 1951-55, 122.

Doctor's Degrees

Seven institutions awarded a total of 9 doctor's degrees, all but one to citizens of the United States. Doctoral training was available at 20 other institutions which reported no award of doctoral degrees. For the academic years 1952-53, 1953-54, and 1954-55, the numbers of graduates receiving doctor's degrees were 5 (3 foreign nationals), 9 (no foreign nationals), and 11 (2 foreign nationals), respectively. In the 10-year period 1946-55 the average number of doctor's degrees conferred per year was 5.6, and for the 5-year period 1951-55, the average was 8.2.

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- (2) Laubusch, E. J., and Ludwig, H. F.: Sanitary engineering degrees awarded in 1955. *Pub. Health Rep.* 71: 945-946, September 1956.
- (3) Miller, A. P.: Sanitary engineering degrees given in 1954. *Pub. Health Rep.* 70: 1039-1040, October 1955.

United States-U.S.S.R. Exchange Missions

EARLY in 1956, under the auspices of the Public Health Service, four Russian virologists visited several poliomyelitis research institutions in the United States. Immediately following their visit, a group of American scientists visited a number of medical institutes and organizations in the Soviet Union.

The Soviet delegation stated that poliomyelitis in the Soviet Union has not presented as much of a public health problem as it has in the United States. There have been several serious outbreaks in certain Soviet Republics, but the incidence rate, though increasing, is approximately one-tenth as high as it is in this country.

Soviet research on poliomyelitis is in the early stages of technical development, but it has nevertheless made important contributions, such as the possible discovery of a type 4 virus. With the establishment of the Poliomyelitis Research Institute, where modern methods and equipment are used and which has an adequate supply of susceptible cells for tissue culture work, it can be expected that Soviet workers will soon be able to do large-scale diagnostic work and competent fundamental research and to use these for the development of applied techniques.

Other timely subjects discussed during the visit of the poliomyelitis team were the early laboratory diagnosis of epidemic influenza, attenuated live virus vaccines against influenza, measles, and mumps, Soviet research work on viral hemorrhagic fevers, viral chorioencephalitis and other virus diseases and the development of vaccines against brucellosis and tularemia.

The Soviet delegation repeatedly stated their belief in the freedom of scientific thought and freedom of exchange of ideas as the cornerstones of international and national science.

They felt sure that the situation in the Soviet Union today is such as to warrant mutual understanding and close relationships between the scientists of the Soviet Union and the United States.

It is hoped that the program of exchange of scientific information, which began with the visit of the four Russian virologists, will continue for the benefit of both countries. Cer-



Profilakticheskii

MONOGRAPH

No. 50

The accompanying article summarizes Public Health Monograph No. 50, published concurrently with this issue of Public Health Reports.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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United States-U.S.S.R. medical exchange missions, 1956. Public Health Monograph No. 50 (PHS Publication No. 536). 95 pages. U. S. Government Printing Office, Washington, D. C., 1955. Price 50 cents.

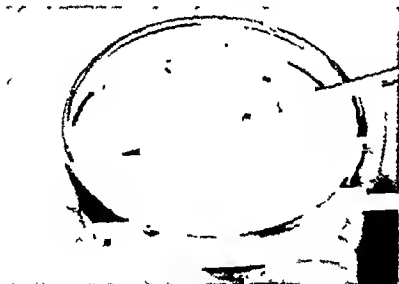
PHS Films

Isolation and Identification of Beta-Hemolytic Streptococci

35-mm. filmstrip, color, sound, 11 minutes, 94 frames. 1957.

Audience: Bacteriologists, laboratory technicians, and medical students.

This film is designed to show the techniques and procedures of isolating and identifying beta-hemolytic streptococci. It covers the preparation of blood agar pour-plates; procedures for isolating samples from swabs; identification of the organisms; and procedures for isolating samples from Loeffler slants. It ends with a brief recapitulation.



Streaking blood agar pour-plate with beta-hemolytic streptococci

The Sanitary Landfill

- I. Operating Procedures
- II. Small Community Landfills

35-mm. filmstrips, color, sound, 7 minutes, 59 frames, and 6 minutes, 41 frames respectively, 1957 and 1956.

Audience: Sanitarians, municipal officials, landfill equipment operators, and students of sanitary engineering.

Basic principles which apply to all landfills are stressed throughout part 1. Variations according to location—level sites, deep valleys, rolling terrain, marshy areas—and other determinants are demon-



Compacting refuse in well-operated landfill.



A sanitary landfill in operation in a small community

strated and accessory practices and equipment described.

The second part shows how the sanitary landfill can be adapted to small towns and communities. It features lightweight equipment in the several alternative practices presented.

Rabies Control in the Community

16-mm. filmstrip, black and white, sound, 11 minutes, 405 feet, 1956.

Audience: Veterinarians, both public health and practicing.



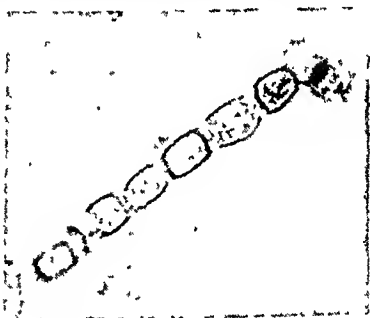
Primarily motivational, this film is not designed for technical training, for use in medical schools, or for TV. Instead it identifies rabies as a public health problem and outlines a three-point program for control on a community basis. The film shows actual cases of rabies in man and dog, how apathy of dog owners permits rabies to become a community problem, and concerted action to prevent rabies.

Coccidioidomycosis—Its Epidemiological and Clinical Aspects

16-mm. film, color, sound, 19½ minutes, 701 feet. 1957.

Audience: Professional medical personnel and mycological laboratory directors.

This film shows the distribution and ecology of the etiological agent, *Coccidioides immitis*; clinical aspects of the benign and disseminated



Chain of arthrospores typical of *C. immitis*.

forms through X-ray films, actual cases and animation; variations in the symptomatology; histology; serology; and laboratory procedures for isolation and identification of the fungus.

These films may be obtained on LOAN from the Communicable Disease Center, Public Health Service, 59 7th Street NE, Atlanta 5, Ga., or by PURCHASE from United World Films, Inc., 1145 Park Avenue, New York 29, N. Y.

National Stay-in-School Campaign

Handbook for communities

Office of Education, Department of Health, Education, and Welfare; Department of Labor. 1957. 24 pages. 15 cents.

Directed to parents, teachers, students, and other interested persons as part of a nationwide campaign, this handbook contains factual information about the school dropout problem and offers specific suggestions for encouraging more high school and college students to stay in school.

The handbook tells why we need a stay-in-school campaign, how to conduct a community drive, and what various individuals can do. Also included are appeals directed to youth, facts illustrating the importance of education, slogans, quotations, and a timetable of activities.

A limited number of free copies are available from the Office of Education, U. S. Department of Health, Education, and Welfare, Washington 25, D. C., and the Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C.

Film Reference Guide for Medicine and Allied Sciences

PHS Publication No. 487. Revised June 1957. 147 pages. 60 cents.

Revised extensively, this guide supersedes all previous issues. It is designed to provide members of the Interdepartmental Committee on Medical Training Aids, as well as film users outside ICMTA member agencies, with a ready reference to selected medical films and to where they can be obtained.

Publication numbers for other ICMTA members are: Air Force,

AFP 160-15-1; Army DA Pamphlet 108-2; Navy, NAV MED P 5042, Rev. 6-57; Veterans Administration, VA Catalog 7.

Copies can be obtained from the Card Division, Library of Congress, Washington 25, D. C.

References on Aging for Health Personnel

PHS Publication (unnumbered) 1957. 19 pages; mimeographed.

A 15-page annotated bibliography of periodicals includes such topics as living arrangements, physical health, mental health, institutional facilities and care. There is also a four-page selected list of books and pamphlets. It was prepared by nursing and nutrition consultants of the Chronic Disease Program.

Milestones in Venereal Disease Control

Highlights of a half century

PHS Publication No. 515. 1957. 11 pages. 10 cents.

Significant events in the history of venereal disease control have been compiled in this pamphlet to provide a handy source of information for persons interested in this field. It also provides an extensive reference list.

Traineeships for Nurses

PHS Publication No. 520. 1957. Folder.

This folder describes what the Professional Nurse Traineeship Program of the Public Health Service offers to graduate nurses interested in preparing for teaching, supervisory, or administrative positions. It outlines traineeship provisions, eligibility requirements, how awards

are made, and when they can be used.

Training institutions where further information can be obtained or application can be made are listed.

Ticks or Ixodides of the U.S.S.R.

PHS Publication No. 548. 1957. By George Anastos. 397 pages.

This comprehensive review of literature brings together into one volume and into the English language available information on ticks in the U.S.S.R.

Under each species information is presented concerning synonymy, geographic distribution and host distribution, hosts of the various stages, seasonal activity, habitat, life cycle, habits, control measures against the species, and parasites of the ticks and their relation to human and animal diseases. Where species of ticks are not endemic to Russia, limited information about their occurrence in other countries is included.

Research Grants and Fellowships Awarded by the Public Health Service in 1956

PHS Publication No. 532. 1957. 98 pages. 30 cents.

Research grants and fellowships awarded by the Public Health Service to non-Federal institutions and to individuals for support of research and training in medical and related sciences for the period July 1, 1955, through June 30, 1956, are listed in this annual report.

A preliminary statement explains briefly the entire awards program and summarizes the awards by the seven categorical institutes and the Division of Research Grants of the National Institutes of Health for fiscal 1956.

The listings are alphabetically arranged by State or country, institution, and investigator or fellow. Following the name of the investigator is a brief descriptive title of

tainly their visit paved the way for the American exchange mission to the Soviet Union.

At the Twentieth Congress of the Communist Party of the Soviet Union, which took place during the visit of the American Mission on Microbiology and Epidemiology to the Soviet Union, reference was made to the detrimental features of overcentralization and secrecy. Encouragement was given to exchanges of opinion, development of research at universities and relaxation of secrecy measures.

At this Congress, also, it was stated that Russia has nearly 3,000 institutions of research and education, of which more than one-third are in Moscow and Leningrad, and that 60 percent of the scientists of the ministries and 85 percent of the members of academies are to be found in these two cities.

The mission found that science has a preferred status in Soviet society. Medical education is under the jurisdiction of the Ministry of Health. There are 78 medical schools; each Republic and each large city has at least one.

About 65 percent of the physicians and medical students are women.

Every activity in science and related technology is grouped into institutes: educational, research, and production. The mission visited 18 institutes and 3 centers of medical training, inspecting laboratory processes and discussing problems of mutual interest, which included poliomyelitis, Russian vaccines (including one for dysentery), preparation of antitoxins and immune globulin, the virus theory of cancer, and other medical and laboratory developments.

The mission found that the Soviet research institutes which they visited all had basic equipment available. Other technical equipment, however, appeared to be in short supply, and they were told that rare chemicals were difficult to procure. The Soviet institutes were equipped to turn out any biological required.

Members of the American Medical Mission were convinced that scientists of the United States should not continue to ignore Soviet medicine and research.

Public Health Adviser and Analyst Positions

Examinations for public health advisers and public health analysts, at basic entrance salaries of from \$4,525 to \$11,610, have been announced by the U. S. Civil Service Commission. These positions are located in the Public Health Service and the Children's Bureau of the Department of Health, Education, and Welfare.

Full information about these examinations may be obtained by writing to the Executive Secretary, Board of U. S. Civil Service Examiners, Public Health Service, Washington 25, D. C.

Public health advisers assist States, communities, and groups in the development of adequate health services, in the maintenance of a healthful environment, in the development of the Nation's hospital and related health facilities, in the administration of

grants-in-aid, and in the improvement of public health administration.

The work performed by the public health analyst involves identifying current and future public health problems and contributing to evaluations of the effectiveness of public health programs and methods. Analysts may have responsibilities for making studies, for example, toward relieving shortages of health personnel, extending service to patients, and making surveys of health problems.

The experience required to fill these positions includes 3 years general and up to 3 years specialized, depending on grade. Four years of appropriate college study may be substituted for the general experience requirements. Graduate study in fields related to the work of a public health adviser or analyst may be substituted for 1 year of the specialized experience requirements.

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*Original article.

the research, an identifying number which indicates the supporting institute, and the funds awarded for fiscal year 1956. Names of fellowship recipients are interspersed alphabetically among research investigators. The type of fellowship, the department of the institution in which the recipient holds his fellowship, and the sponsoring institute are indicated.

Health Manpower Source Book

Dental hygienists

PHS Publication No. 263, section 8. 1957. By Walter J. Pelton, Elliott H. Pennell, and Helen M. Varra. 87 pages; tables and charts. 50 cents.

This first national inventory of the dental hygiene profession is designed to aid dental manpower planning programs by providing statistical information regarding current status and recent trends in supply and demand for hygienist's services.

In addition to a brief history of the profession, the source book includes information on number, location, and capacity of dental hygiene schools; age and school attended by students graduating in different years; the educational costs, residence, and planned practice locations for students currently in school. The development of State laws governing the practice of dental hygiene and current legal requirements for licensure are discussed.

The report presents data on geographic location, personal characteristics, employment status, and years of professional experience for a large group of dental hygienists who participated in a nationwide survey. Types of employment, hours worked, pay rates, and total earnings are analyzed for those currently active. Reasons given for retirement and plans for return to professional work are tabulated for those inactive at the time of the survey.

Survival ratios, by year of graduation, show the proportion licensed and proportion practicing in mid-

1954. They reflect the impact of retirement on the service potential of dental hygienists.

What is Past is Prologue

Communicable Disease Center, PHS Publication. August 1957. 38 pages.

This comprehensive progress report reviews the activities of the Health Services Training Section of the Communicable Disease Center's Training Branch since its establishment in 1955 to extend education and training services to physicians, veterinarians, nurses, record analysts, and others not previously served.

Personnel in State public health training programs, continued education activities of institutions of higher learning, and professional schools of the health sciences will find the report of special interest.

Single copies can be obtained by addressing the Chief, Communicable Disease Center, Public Health Service, 50 Seventh St., NE., Atlanta 23, Ga., Attention: Chief, Training Branch.

How To Be a Nursing Aide in a Nursing Home

PHS and American Nursing Home Association Publication (unnumbered). 213 pages; illustrated. \$2.50.

Clearly written and fully illustrated, this manual tells nursing home aides how to perform simple nursing procedures.

The introduction gives pointers on appearance, health, and conduct. There are 62 lessons, each consisting of three parts—a brief introduction, what to do, and a series of questions. Helping patients achieve self-care is emphasized.

The lessons include making a bed; helping with food service; helping a patient into a chair; helping with a bed bath; care for the hands, fingernails, and hair of a patient; helping a patient dress and undress; how to use a footrest; admitting and discharging a patient; care of equip-

ment; taking temperature, pulse, and respiration; preventing bedsores; care for an incontinent patient; and care for a critically ill patient.

Copies can be ordered from The American Nursing Home Association, Hotel Bancroft, Springfield, Ohio.

Cerebral Vascular Disease and Strokes

PHS Publication No. 513. 1957. 15 pages; illustrated. 10 cents; \$7.50 per 100.

Designed to give the public understandable facts about cerebral vascular disease and to encourage hopeful and constructive attitudes toward this problem, this booklet is written in popular language and is simply illustrated.

It describes the cerebral vascular system, what it is and how it works, causes and effects of cerebral vascular disease, strokes (cerebral vascular accidents), prevention, how strokes strike, hope and help for people who have had strokes, treatment, and rehabilitation.

WHOOPIING COUGH. *PHS Publication No. 220. (Health Information Series No. 60.) Revised 1957. 1-fold leaflet. \$2 per 100.* Stresses the dangers of whooping cough and describes symptoms, communicability, prevention, and treatment of the disease.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

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CORRECTIONS

MARCH, p. 243, 2d column, lines 15 and 16, in the report entitled "Periodontium Not Injured by Use of Fluoride Water," a summary of a paper by Dr. Albert L. Russell, the figures should be reversed so that the text reads: "One of the comparisons was between 379 adults . . . in Colorado Springs . . . and 144 adults . . . in Boulder . . . Colo."

FEBRUARY, p. 167, 1st column, in the article entitled "Smallpox Control by Mass Vaccination With Dried Vaccine," by Harald Frederiksen and James P. Sheehy, this statement appears: ". . . yet it [dried vaccine] has been systematically produced and used on a large scale only in one country, Indonesia." A correspondent reports that the product is also produced in Saigon, Viet Nam. The embassy of that country informs us that "dried vaccine against smallpox has been produced at the Pasteur Institute in Saigon since 1925, and the average annual production is 9,000,000 doses."

